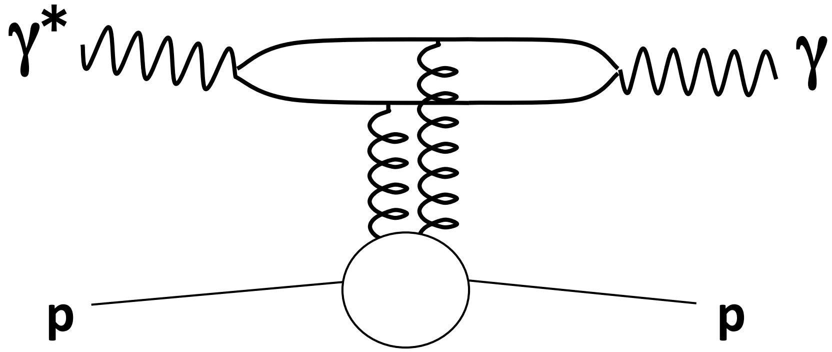
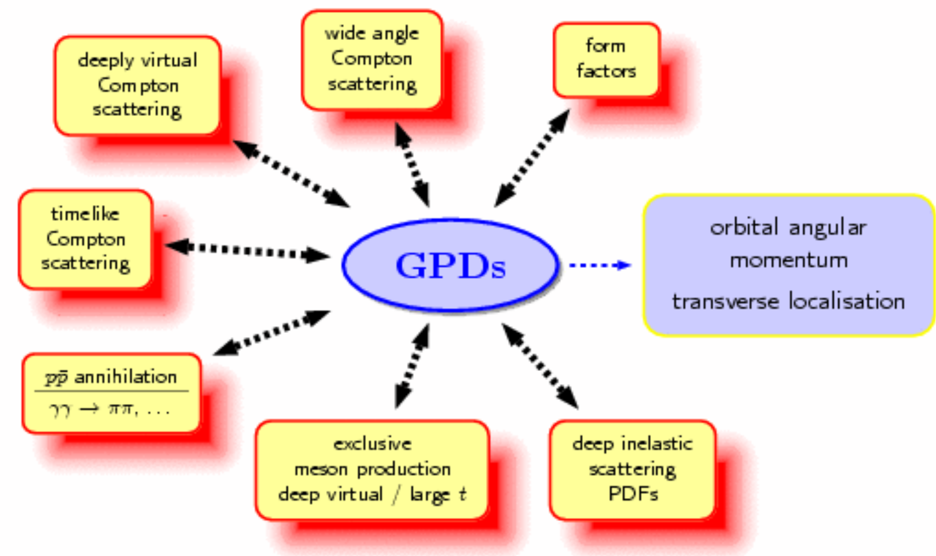
GPDs at an eRHIC

Salvatore Fazio
BNL





XX International Conference on Deep-Inelastic Scattering and Related Subjects

University of Bonn, *Germany*

March 26-30, 2012

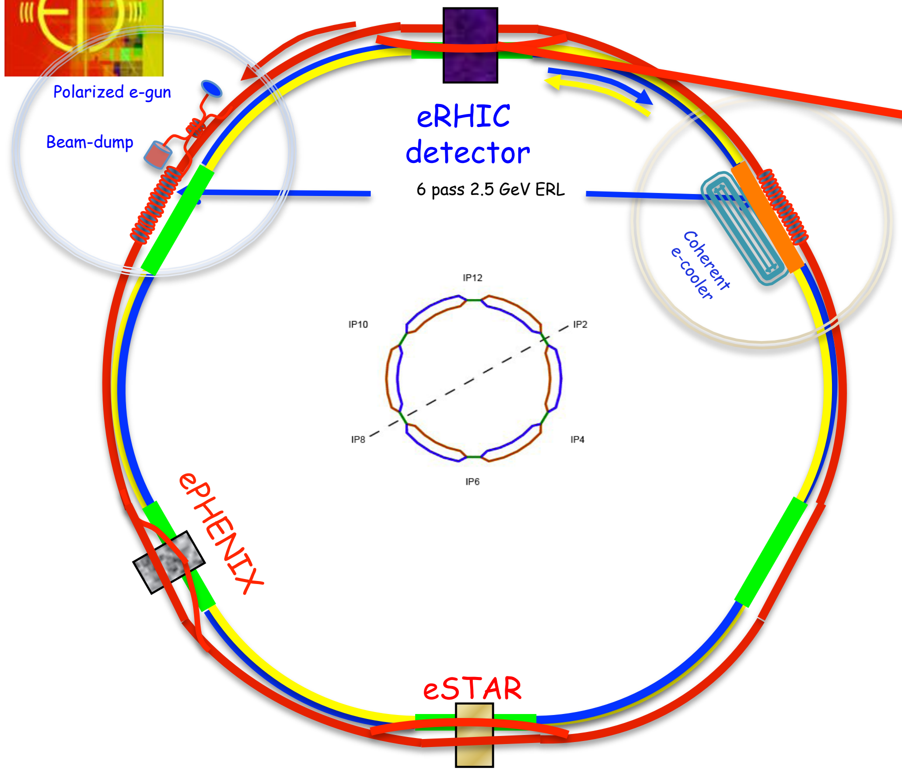
Plan of the talk

- The eRHIC accelerator and an EIC detector capabilities for exclusive diffraction
- GPDs and DVCS
  - Bethe-Heitler subtraction
  - |t|-differential cross sections
  - Charge and spin asymmetries
- Imaging with an eRHIC (the impact!)
- DVCS on nuclei and J/ψ
- Summary

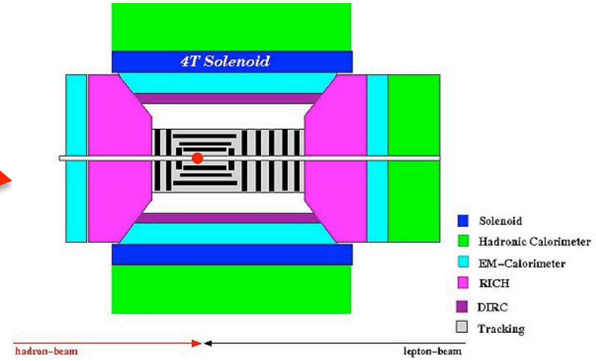
See also:
D. Mueller's and
M. Diehl's talks

The eRHIC collider

EIC/eRHIC



eRHIC detector

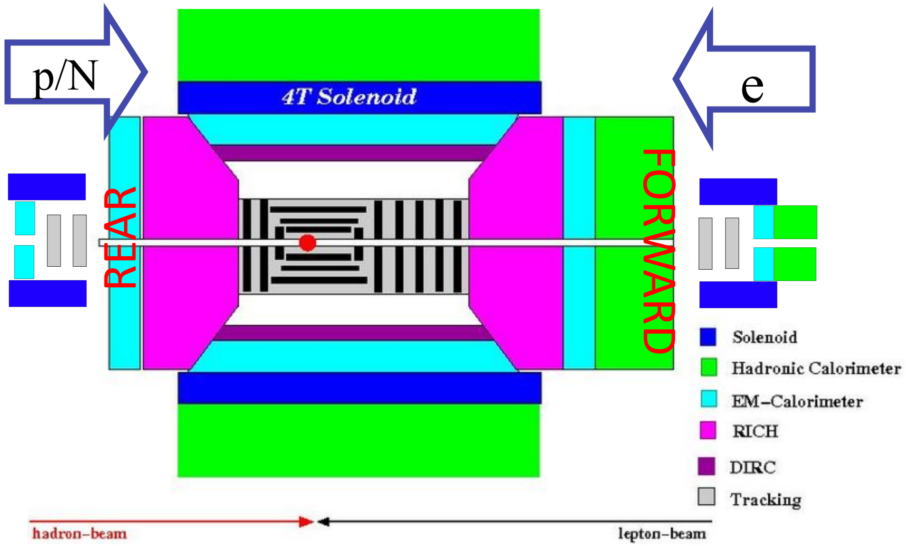


- An electron ring will be built at the RHIC facility
- The current experiments can be upgraded for ap(A) physics
- A new dedicated detector will be built

- 5 - 20 GeV electrons on 100-250 (130) GeV protons (nuclei). Polarization of electrons and protons (nuclei)
- Lumi: 0.62×10^{33} $cm^{-2}s^{-1}$ (stage 1-ep pol)
  3.1×10^{33} $cm^{-2}s^{-1}$ (stage 1-ep unp)
  9.7×10^{33} $cm^{-2}s^{-1}$ (stage 2-ep)

Important for exclusive DIS:
- Dedicated forward instrumentation
- High tracker coverage
- Very High lumi!

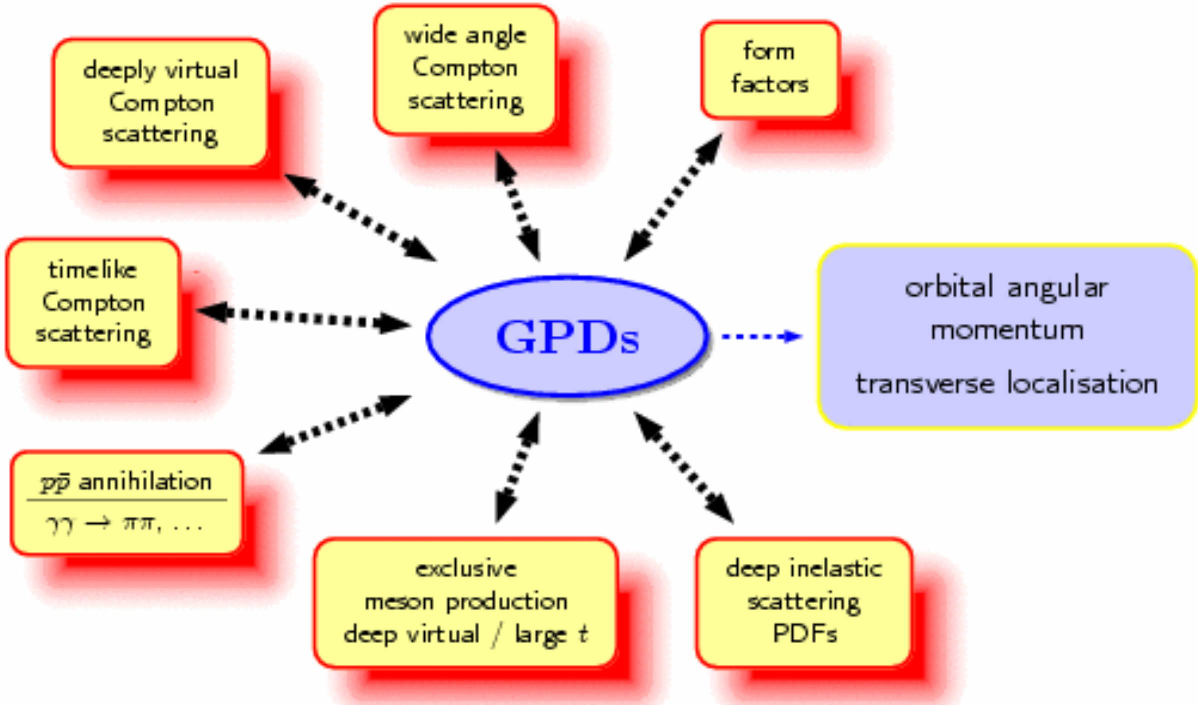
The EIC detector



General properties:
- Hermetic
- Asymmetric

Important for exclusive diffraction:
- Hermetic Central Tracking Detector (Si pixels)
- Good em calorimeter resolution with fine granularity (fibres)
- Very forward calorimetry
- **Roman pots from the early beginning (and with excellent acceptance)**

Accessing the GPDs



$$\frac{1}{2} = J_q^z + J_g^z = \frac{1}{2}\sum_q \Delta q + \sum_q \mathcal{L}_q^z + J_g^z$$

$$J_q^z = \frac{1}{2}\sum_q \Delta q + \sum_q \mathcal{L}_q^z$$

$$J_q^z = \frac{1}{2}\left(\int_{-1}^{1} x\,dx\left(H^q + E^q\right)\right)_{t\to 0}$$

quantum number of final state selects different GPDs:

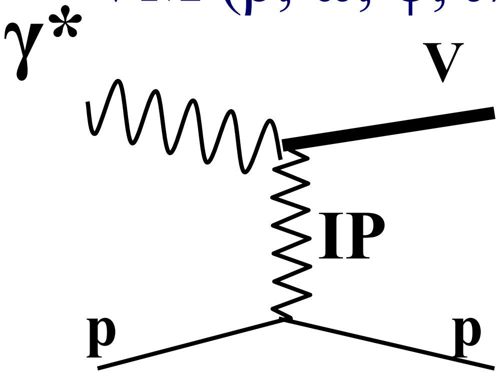
- theoretically very clean
  DVCS (γ): H, E, $\tilde{H}$, $\tilde{E}$
- VM (ρ, ω, ϕ): H E
- info on quark flavors
  PS mesons (π, η): $\tilde{H}$ $\tilde{E}$

π^0	$2\Delta u+\Delta d$
η	$2\Delta u-\Delta d$

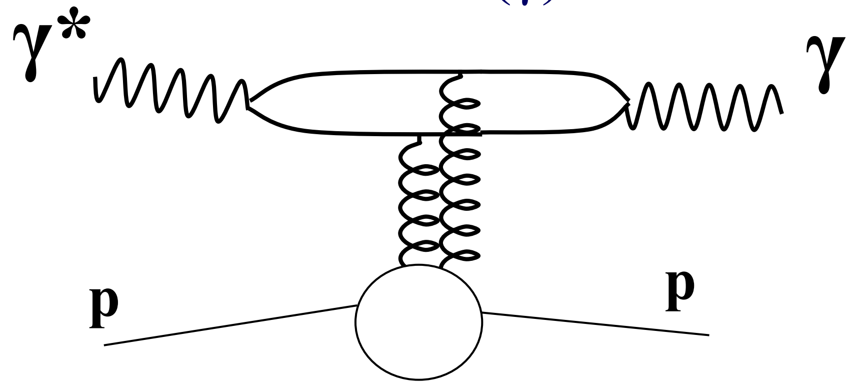
ρ^0	2u+d, 9g/4
ω	2u−d, 3g/4
ϕ	s, g
ρ^+	u−d
J/ψ	g

Deeply Virtual Compton Scattering

VM (ρ, ω, φ, J/ψ, Y)



DVCS (γ)



Scale: $Q^2 + M^2$ ⟷ Q^2

A GOLDEN MEASUREMENT!

DVCS properties:

- **Similar to VM production, but γ instead of VM in the final state**
- **Very clean experimental signature**
- **Not affected by VM wave-function uncertainty**
- **Hard scale provided by Q^2**

Observables for $e^-p \to e^-p\gamma$ at small x_B

DVCS cross section (dominated by *H* and slightly dependent on *E*)

$$\frac{d\sigma^{\mathrm{DVCS}}}{dt}(W,t,Q^2) \approx \frac{\pi\alpha^2}{Q^4}\frac{W^2 x_{\mathrm{Bj}}^2}{W^2+Q^2}\left[|\mathcal{H}|^2 - \frac{t}{4M_p^2}|\mathcal{E}|^2\right](x_{\mathrm{Bj}},t,Q^2)\Big|_{x_{\mathrm{Bj}}\approx\frac{Q^2}{W^2+Q^2}}$$

(electron) beam spin asymmetry (dominated by *H* and slightly dependent on *E*)

$$A_{\mathrm{BS}}^{(1)} \propto y\left[F_1(t)H(\xi,\xi,t,Q^2) - \frac{t}{4M^2}F_2(t)E(\xi,\xi,t,Q^2) + \cdots\right]$$

sin(ψ) transverse target spin asymmetry (governed by *E* and *H*)

$$A_{\mathrm{TS}}^{\Uparrow(1)} \propto \frac{t}{4M^2}\left[F_2(t)H(\xi,\xi,t,Q^2) - F_1(t)E(\xi,\xi,t,Q^2) + \cdots\right]$$

cos(ψ) transverse and longitudinal target spin asymmetries are sensitive to parity odd GPDs – expected to be suppressed at small x_B

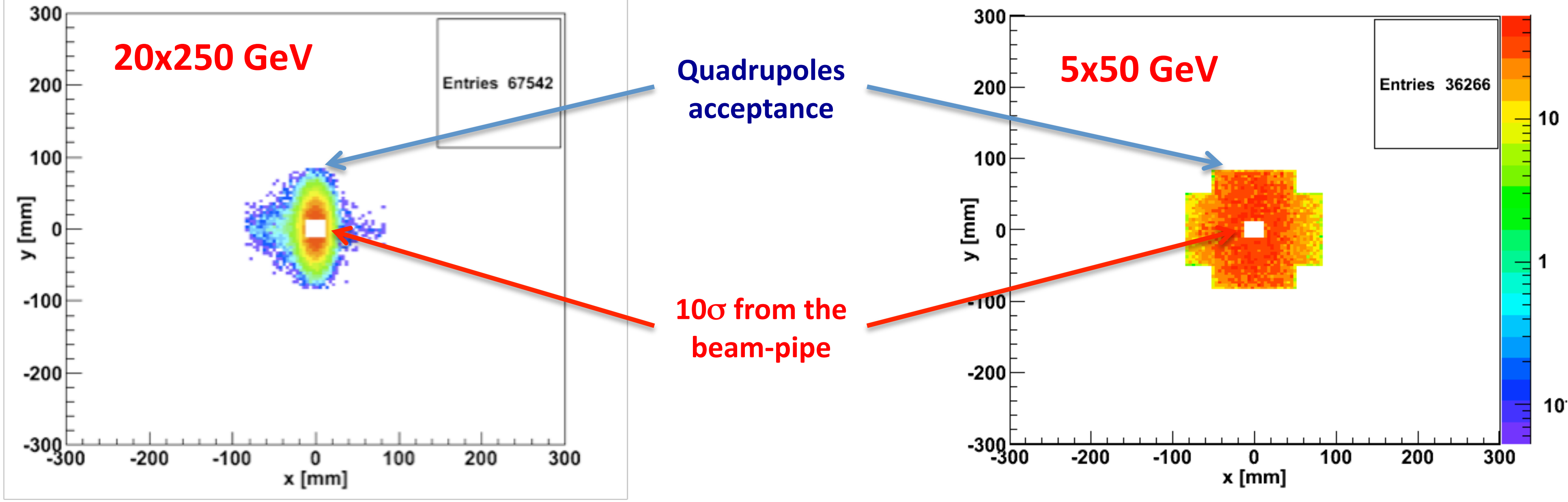
$$A_{\mathrm{TS}}^{\Downarrow(1)} \propto \frac{t}{4M^2}\left[F_2(t)\widetilde{H}(\xi,\xi,t,Q^2) - F_1(t)\xi\widetilde{E}(\xi,\xi,t,Q^2) + \cdots\right]$$

$$A_{\mathrm{TS}}^{\Rightarrow(1)} \propto \left[F_1(t)\widetilde{H}(\xi,\xi,t,Q^2) - \frac{t}{4M^2}F_2(t)\xi\widetilde{E}(\xi,\xi,t,Q^2) + \cdots\right]$$

Direct |t| measurement @ eRHIC

Plots from J-H Lee

Accepted in "Roman Pot" (example) at s=20m



- high-t acceptance mainly limited by magnet aperture
- low-t acceptance limited by beam envelop (~10σ)
- t-resolution limited by
  - beam angular divergence ~100μrad for small t
  - uncertainties in vertex (x,y,z) and transport
  - ~<5-10% resolution in t (RP at STAR)

Roman Pots at HERA

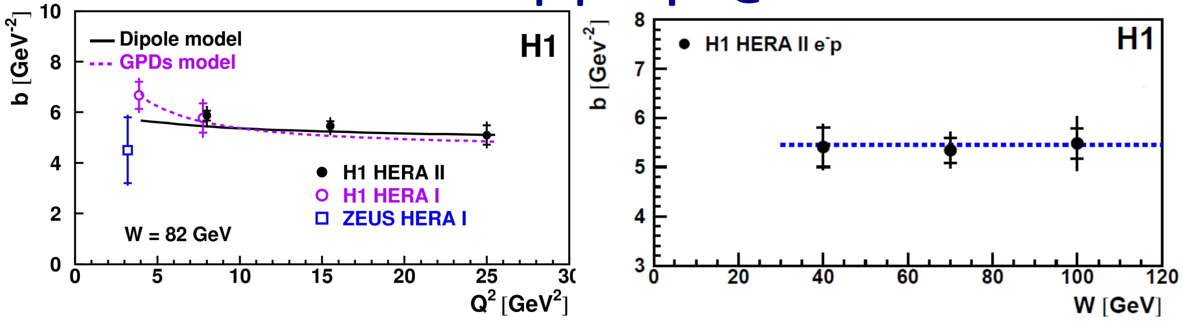
ZEUS

$L = 27.77\ pb^{-1}$

55 events (DVCS + BH)

Scanning the phase space…

DVCS |t|-slope @ HERA



EIC lumi:
~10 fb^{-1}/year @ stage 1 – 5x100
~10 fb^{-1}/month @ stage 2 – 20x250

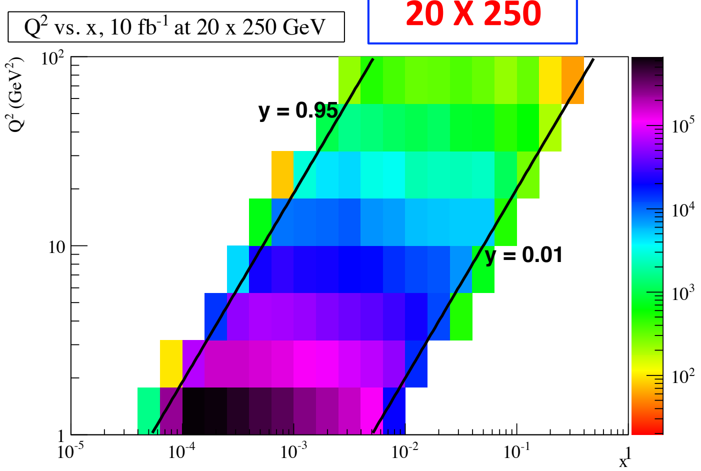
- ✧ EIC will provide sufficient luminosity to bin in multi-dimensions
- ✧ wide x and Q^2 range needed to extract GPDs

10 x-bins → [1.;1.58;2.51;4.;6.3;15.8;25.1;39.8;63.1;100]X10^{-3} (stage 1)
[1.;1.58;2.51;4.;6.3;15.8;25.1;39.8;63.1;100]X10^{-4} (stage 2)

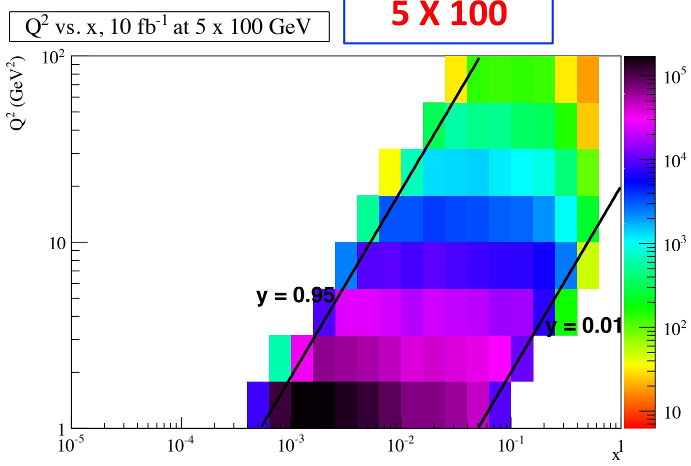
5 Q^2-bins → [1.;1.78;3.16;5.62;10;17.78] GeV^2

9 |t|-bins → [0.01;0.05;0.12;0.2;0.3;0.43;0.58;0.80] and [1.0;1.2;1.5] GeV^2 (asym. meas.)

20 X 250

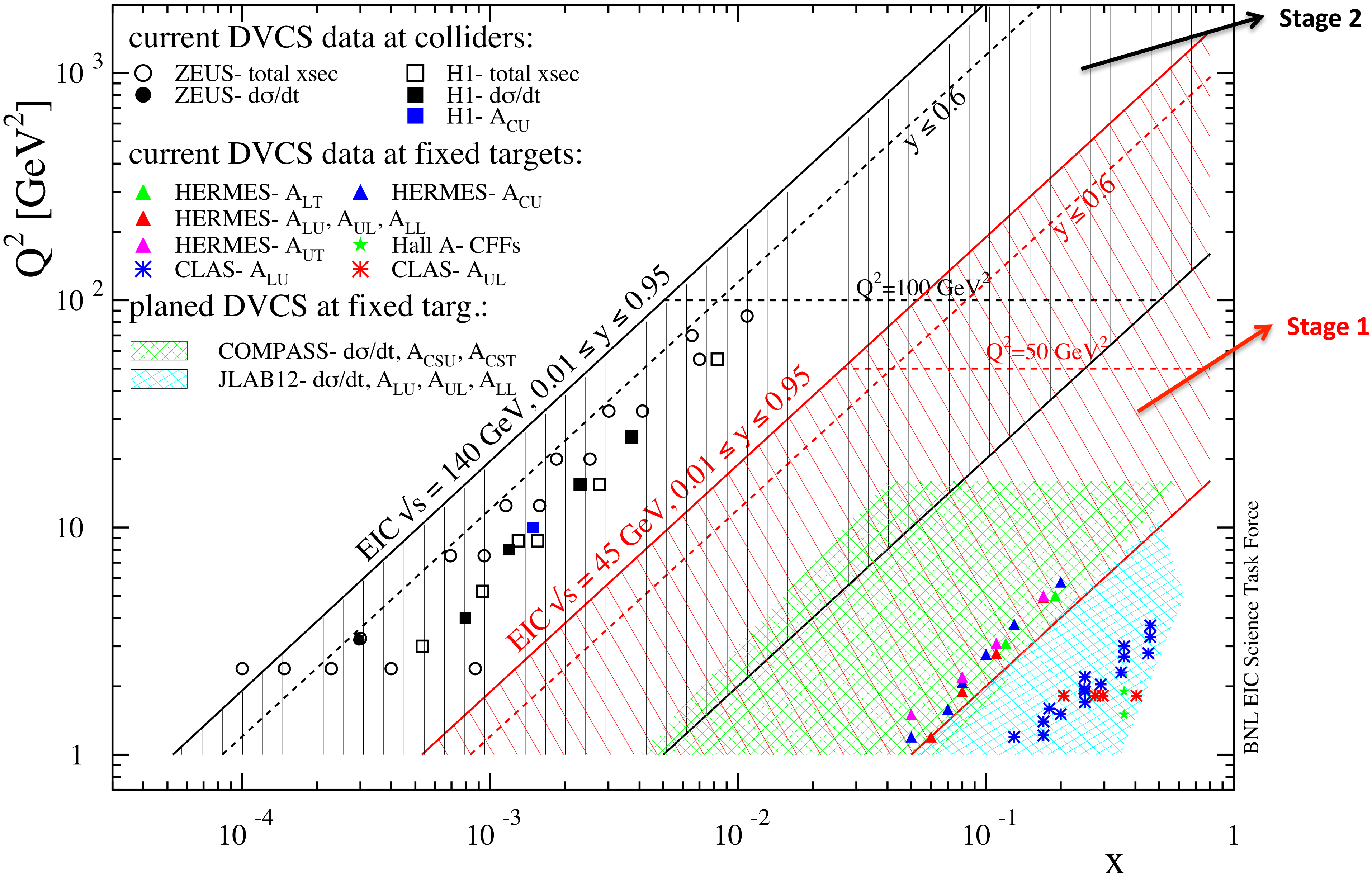


5 X 100



… we can do a fine binning in Q2 and W… and even in |t|

DVCS phase-space



MC simulation

Written by E. Perez, L Schoeffel, L. Favart [arXiv:hep-ph/0411389v1]

The code MILOU is Based on a GPDs convolution model by:
A. Freund and M. McDermott [All ref.s in: http://durpdg.dur.ac.uk/hepdata/dvcs.html]

✓GPDs, evolved at NLO by an indipendent code which provides tables of CFF

- at LO, the CFFs are just a convolution of GPDs:

$$\mathscr{H}(\xi,Q^2,t)=\sum_{\mathrm{u,d,s}}\int_{-1}^{1}\left[\frac{e_i^2}{1-x/\xi-i\varepsilon}\pm\{\xi\to-\xi\}\right]H_i\left(x,\xi,Q^2,t\right)dx$$

✓provide the real and imaginary parts of Compton form factors (CFFs), used to calculate cross sections for DVCS and DVCS-BH interference.

$$\frac{d\sigma}{dx\,dy\,d|t|\,d\phi\,d\varphi}=\frac{\alpha^3 x_B y}{16\pi^2 Q^2\sqrt{1+\varepsilon^2}}\left|\frac{\mathcal{I}}{e^3}\right|$$

$$\phi=\phi_N-\phi_l$$

$$\varphi=\Phi_T-\phi_N$$

$$\varepsilon\equiv 2x\frac{m_N}{Q}$$

$$\left|\mathcal{I}_{\mathcal{BH}}\right|^2=\frac{e^6}{x^2y^2(1+\varepsilon^2)^2\Delta^2\mathcal{P}_1(\phi)\mathcal{P}_2(\phi)}\left\{c_0^{BH}+\sum_{n=1}^{2}c_n^{BH}\cos(n\phi)+s_1^{BH}\sin(\phi)\right\}$$

$$\left|\mathcal{I}_{\mathcal{DVCS}}\right|^2=\frac{e^6}{y^2Q^2}\left\{c_0^{DVCS}+\sum_{n=1}^{2}\left[c_n^{DVCS}\cos(n\phi)+s_n^{DVCS}\sin(n\phi)\right]\right\}$$

$$\left|\mathcal{I}\right|^2=\frac{\pm e^6}{xy^3\Delta^2\mathcal{P}_1(\phi)\mathcal{P}_2(\phi)}\left\{c_0^{I}+\sum_{n=1}^{3}c_n^{I}\cos(n\phi)+s_1^{I}\sin(\phi)\right\}$$

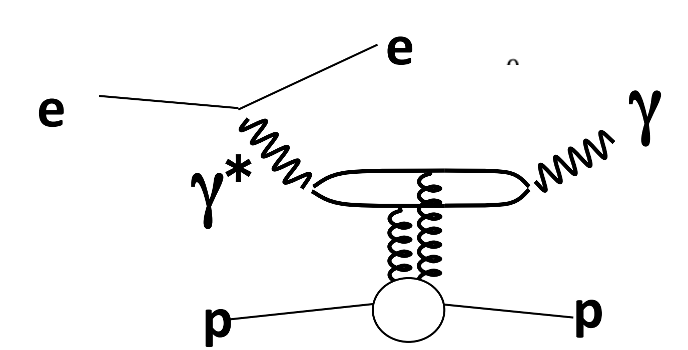
✓ $\frac{d\sigma}{d|t|}=\exp\left(B\left(Q^2\right)t\right)$ -> The B slope is allowed to be costant or to vary with Q^2:

✓Proton dissociation ($ep\to e\,\gamma\,Y$) can be included

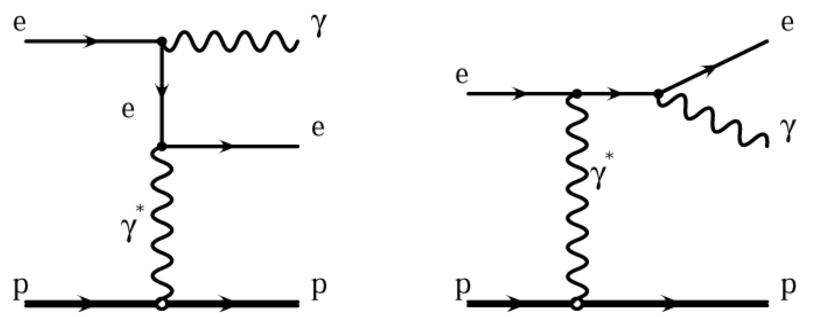
✓Other non-GPD based models are implemented like FFS, DD

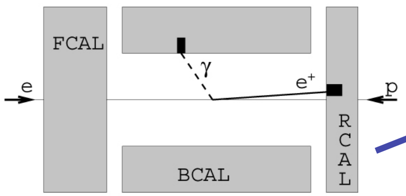
DVCS - BH

DVCS

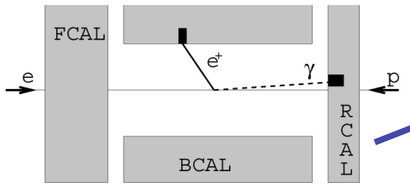


BH





γ sample: no tracks matching to the second candidate **(DVCS+BH)**

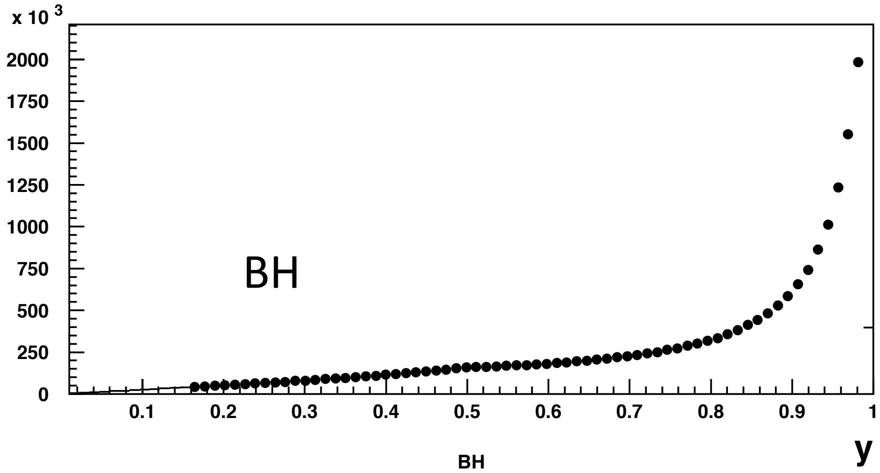


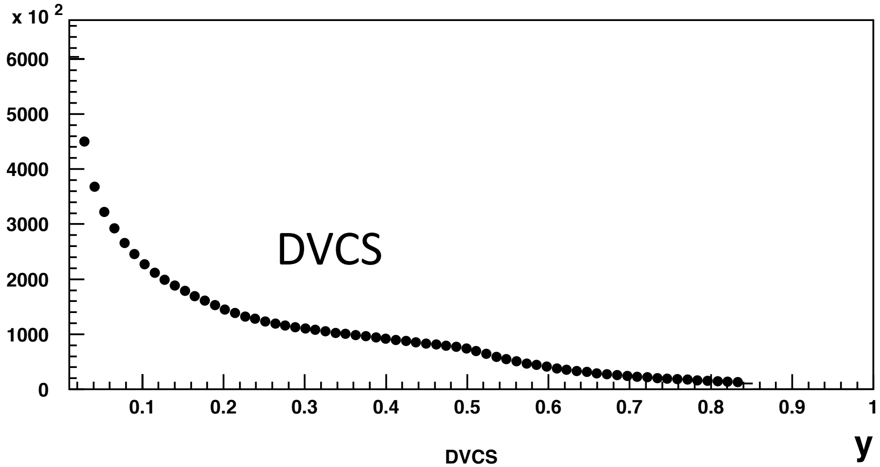
e sample: a track match to the second candidate **(BH+ bkgd)**

Wrong-sign sample: a negative track match to the second candidate **(bkgd)**

Fraction of Bethe-Heitler

20 X 250





BH events generated

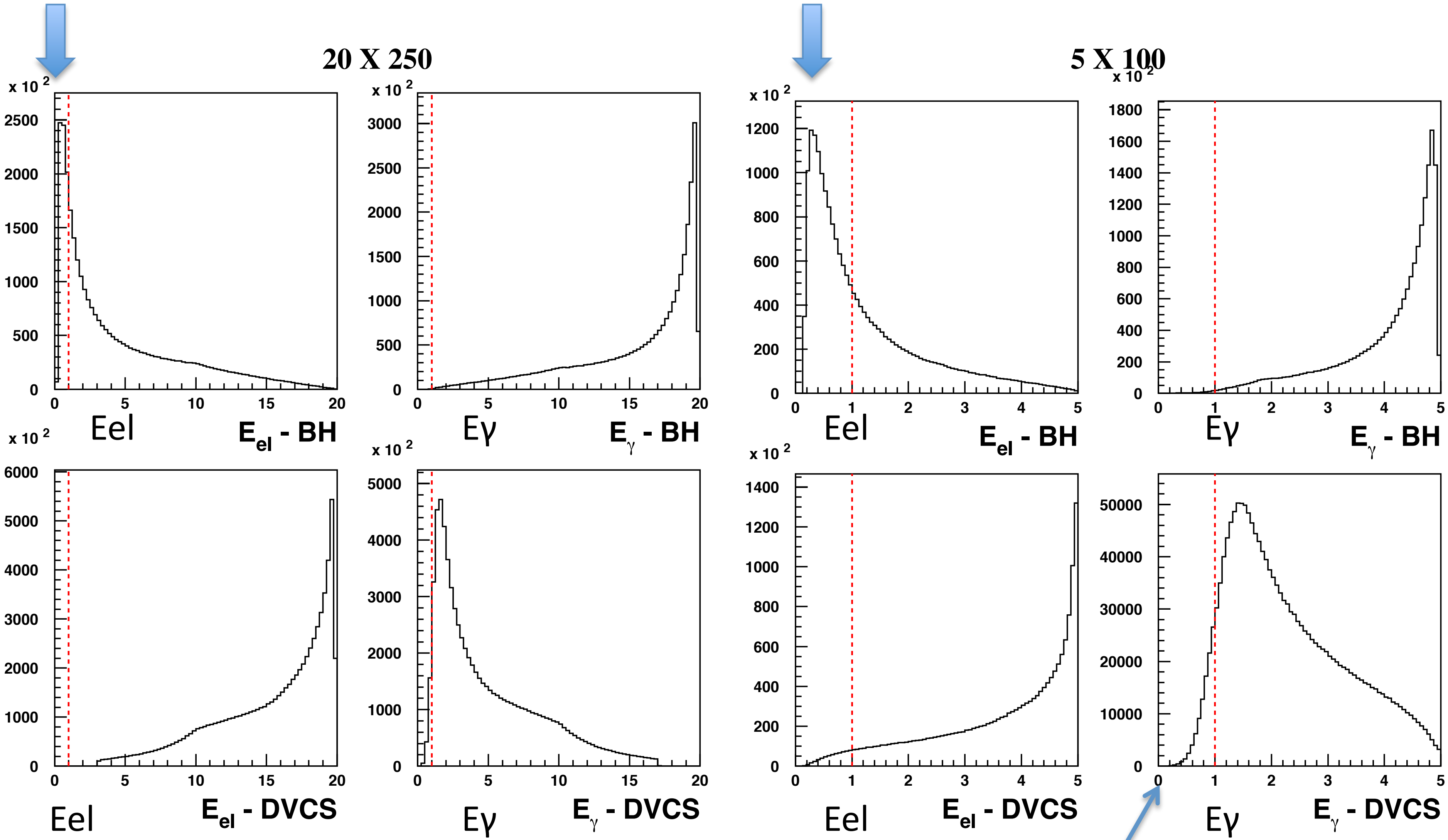
- $0 < |t| < 1.0$ GeV^2
- $10^{-4} < x < 0.1$
- $0.01 < y < 0.99$

Same as DVCS

$$frac(BH) = \frac{BH_{evt}}{BH_{evt} + DVCS_{evt}}$$

- Proton dissociation not included for both DVCS and BH (but mostly process independent…)
- BH dominates at large y
- Part of BH will be removed by DVCS selection criteria

BH is "precisely" known but to certain level!
Uncertainty on proton form factor → **uncertainty on BH xsec ~ 3%**

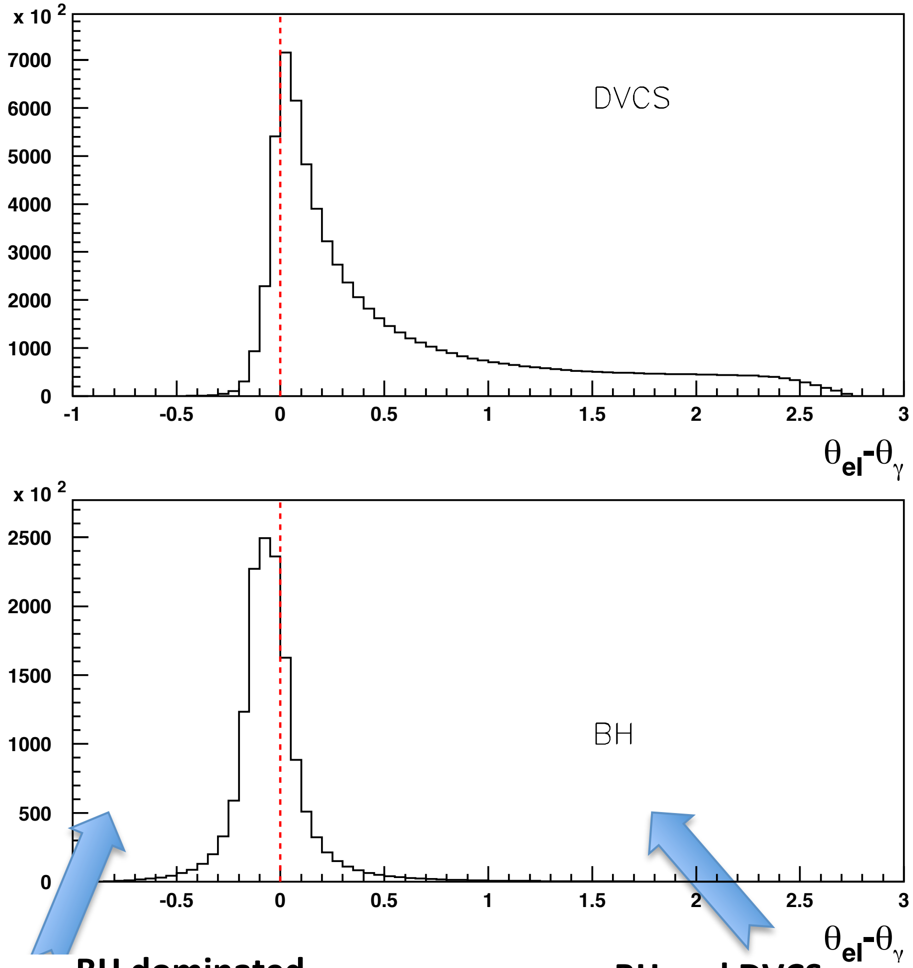


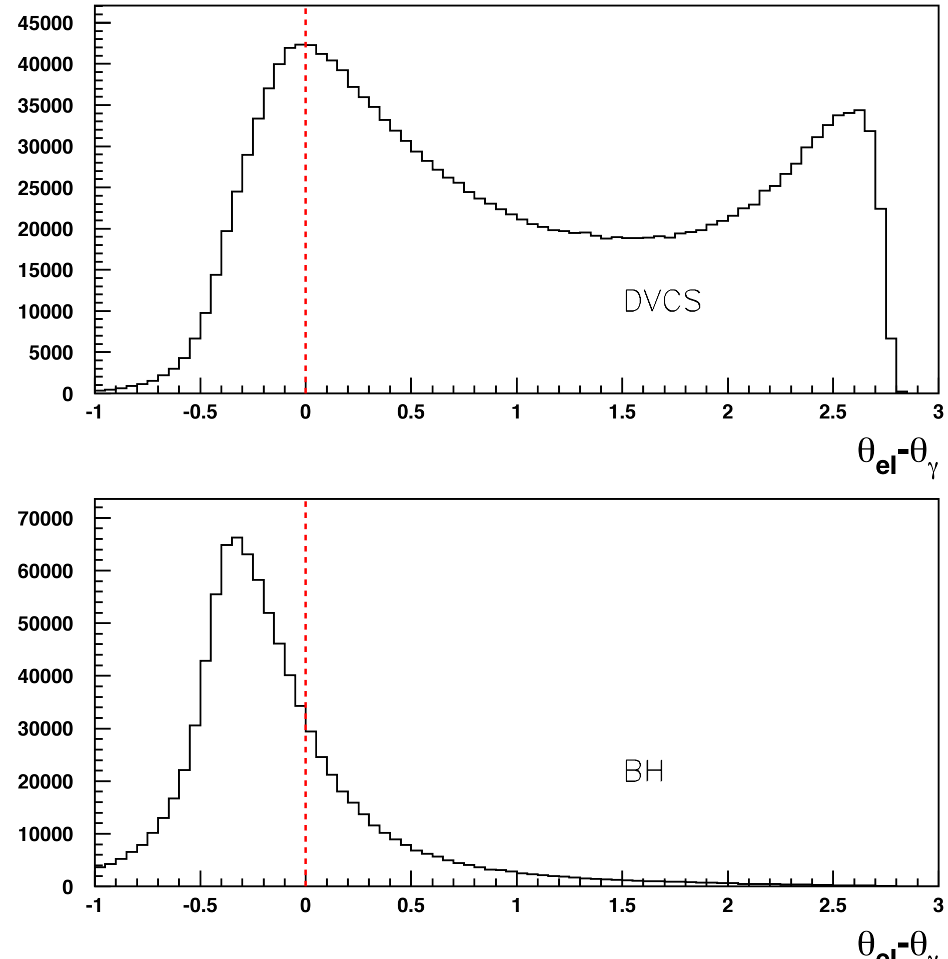
1. **BH photon has very low energy (often below 1 GeB)**
2. **Photon for BH (ISR) goes often forward (trough the beam pipe**

Important!
Em Cal must discriminate clusters above noise down to 1 GeV

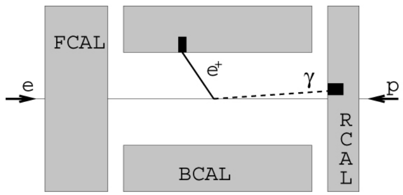
BH rejection

20 X 250 **5 X 100**

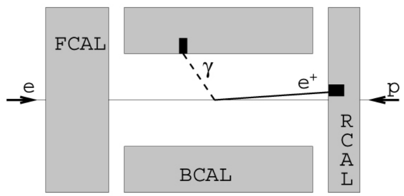




BH dominated



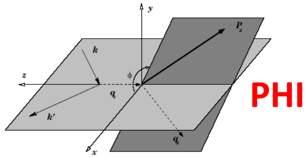
BH and DVCS



In DVCS most of the photon are less "rear"
Than the electrons:
(θel-$\theta\gamma$) > 0 → rejects most of the BH

BH rejection

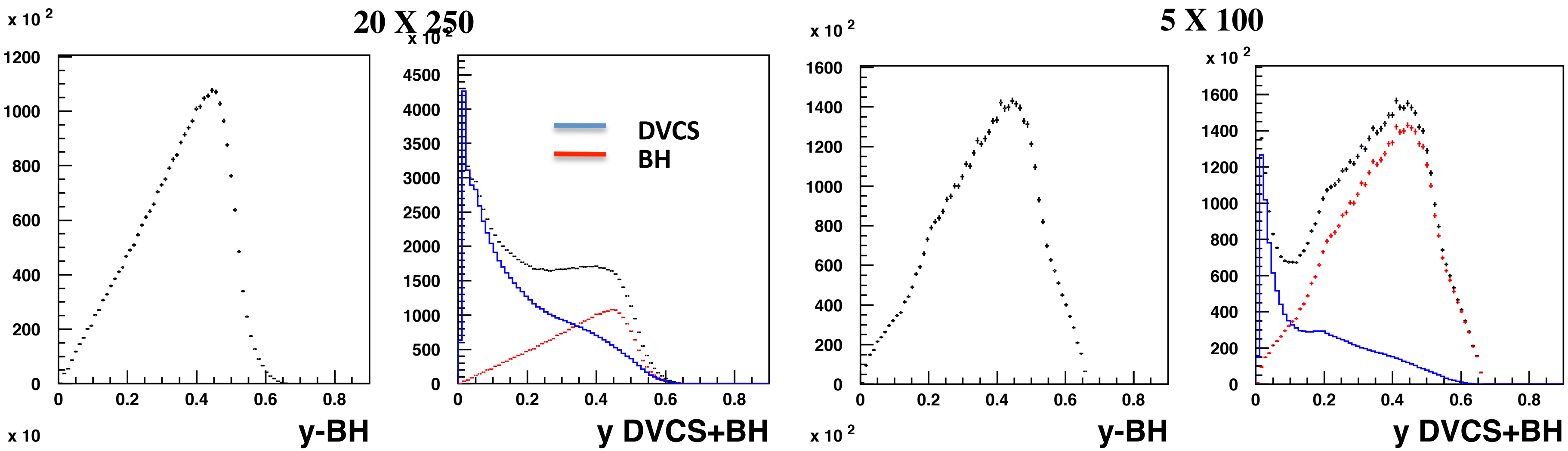
- A "cut" on a minimum value the angular difference btw the two clusters can affect the phi distribution reconstruction!
- but we cannot go below the resolution of our em cal!



Crucial!
Our em cal must distinguish two clusters within the order of 1 deg
More studies on-going…

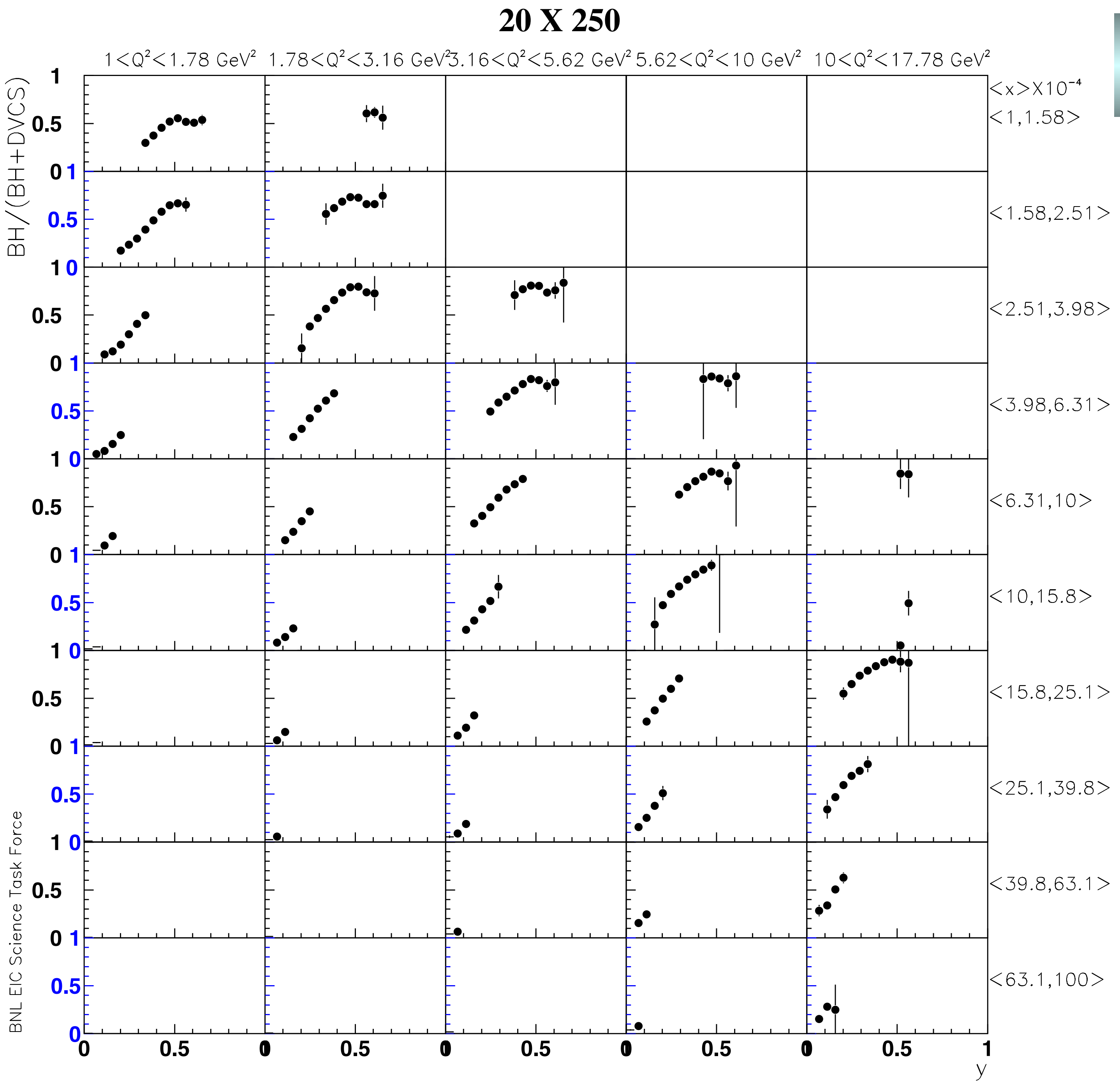
Additional acceptance criteria:

- em clusters to be < 0.02 rad from the beam-pipe (1 deg is the angular acceptance + some "box cut")



DVCS and BH samples normalized at lumi

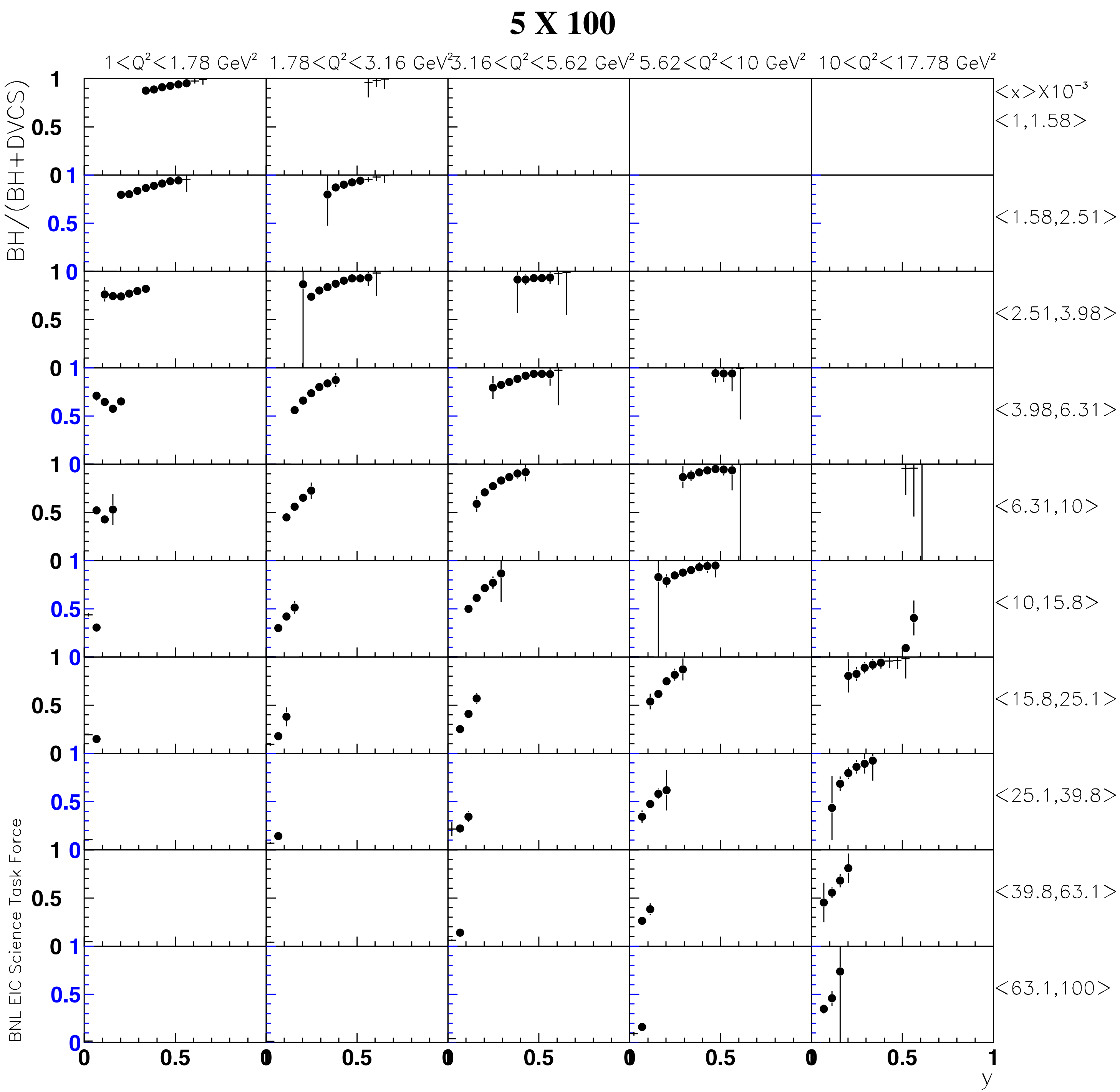
BH fraction



Stage 2

BH subtraction will be not an issue for y<0.6

BH fraction

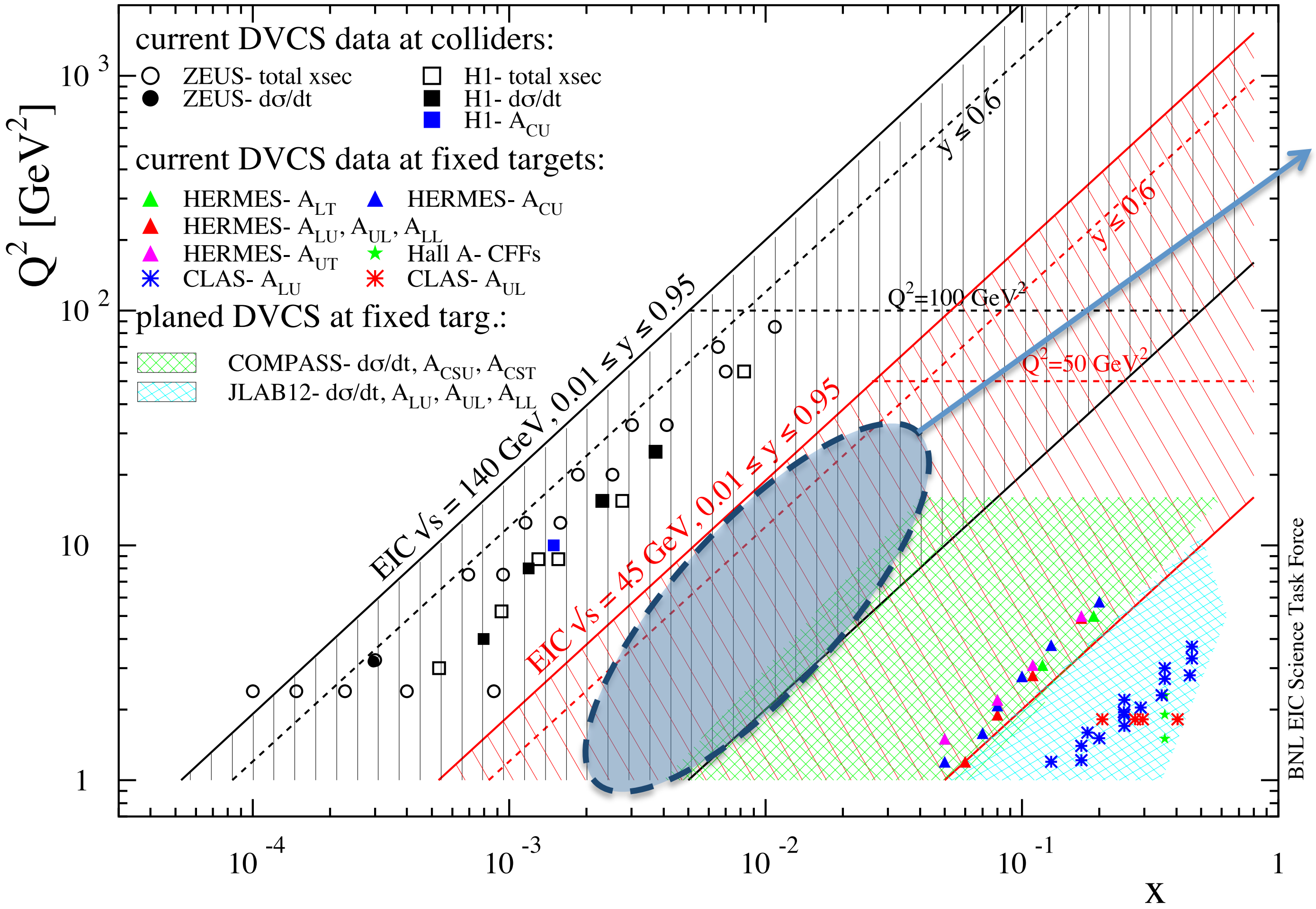


Stage 1

BH subtraction will be relevant in stage 1, at large y, depending on the x-Q^2 bin

BUT…

DVCS phase-space



Stage 1-2 overlapping:

x-section measurements in stage 2 at low-y can cross-check the BH subtraction made in stage 1

Parameters and selection

Overall:

- $1.5 < Q^2 < 100$ GeV^2
- $10^{-5} < x < 0.1$
- $0.01 < y < 0.85$
- $0 < |t| < 1.5$ GeV^2
- t slope: B = 5.6 (costant)
- GPDs evolved at NLO

$0.01 < |t| < 0.85$ GeV^2
(Low-|t| sample)

- Very high statistics
- Systematics will dominate!
- Within Roman pots acceptance

$1.0 < |t| < 2.0$ GeV^2
(Large-|t| sample)

- Xsec goes down exponentially
- Good binned measurements require a year of data taking @ 20x250 GeV (stage 2)
- Main detector can be used in measuring |t| from momentum conservation.

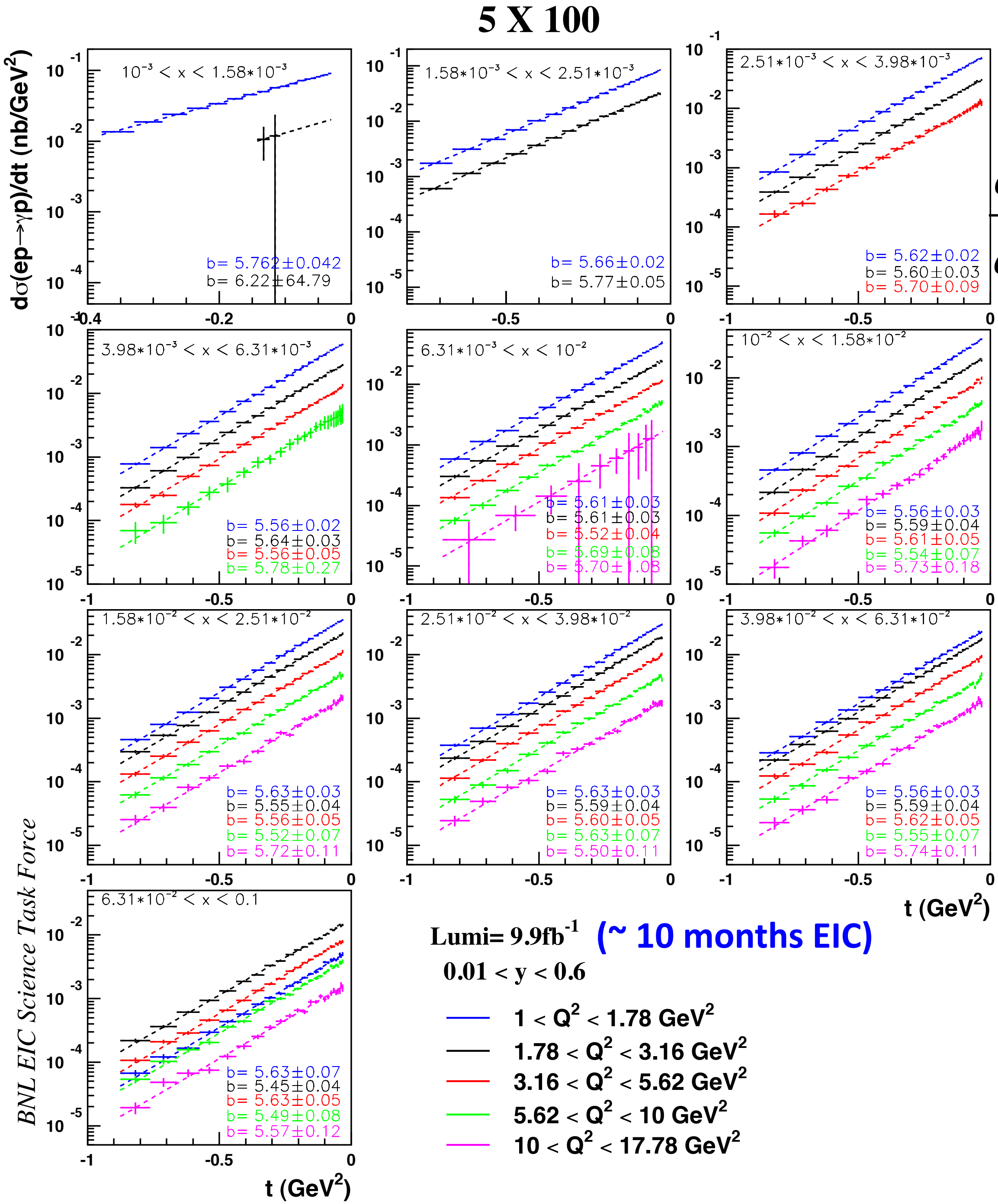
Stage 1: 5 X 100 GeV

Low-|t| sample -> ~10 fb^{-1} (~ a year)
$0.01 < y < 0.6$
Several Q2 and x bins
Acceptance criteria
x-sec:
BH rejection criteria
Asymmetries:
$0.01 < y < 0.85$
Several |t| bins

Stage 2: 20 X 250 GeV

Low-|t| sample -> ~20 fb^{-1} (~ two months)
Large-|t| sample -> ~100 fb^{-1} (~ a year)
$0.01 < y < 0.6$
Several Q2 and x bins
Acceptance criteria
x-sec:
BH rejection criteria
Asymmetries:
$0.01 < y < 0.85$
Several |t| bins

dσ/d|t|- Stage 1



$$\frac{d\sigma}{d|t|} = \frac{\#\,evt}{\Delta_{bin} \bullet A \bullet \mathcal{L}} \qquad \sim e^{-bt}$$

b=5.6

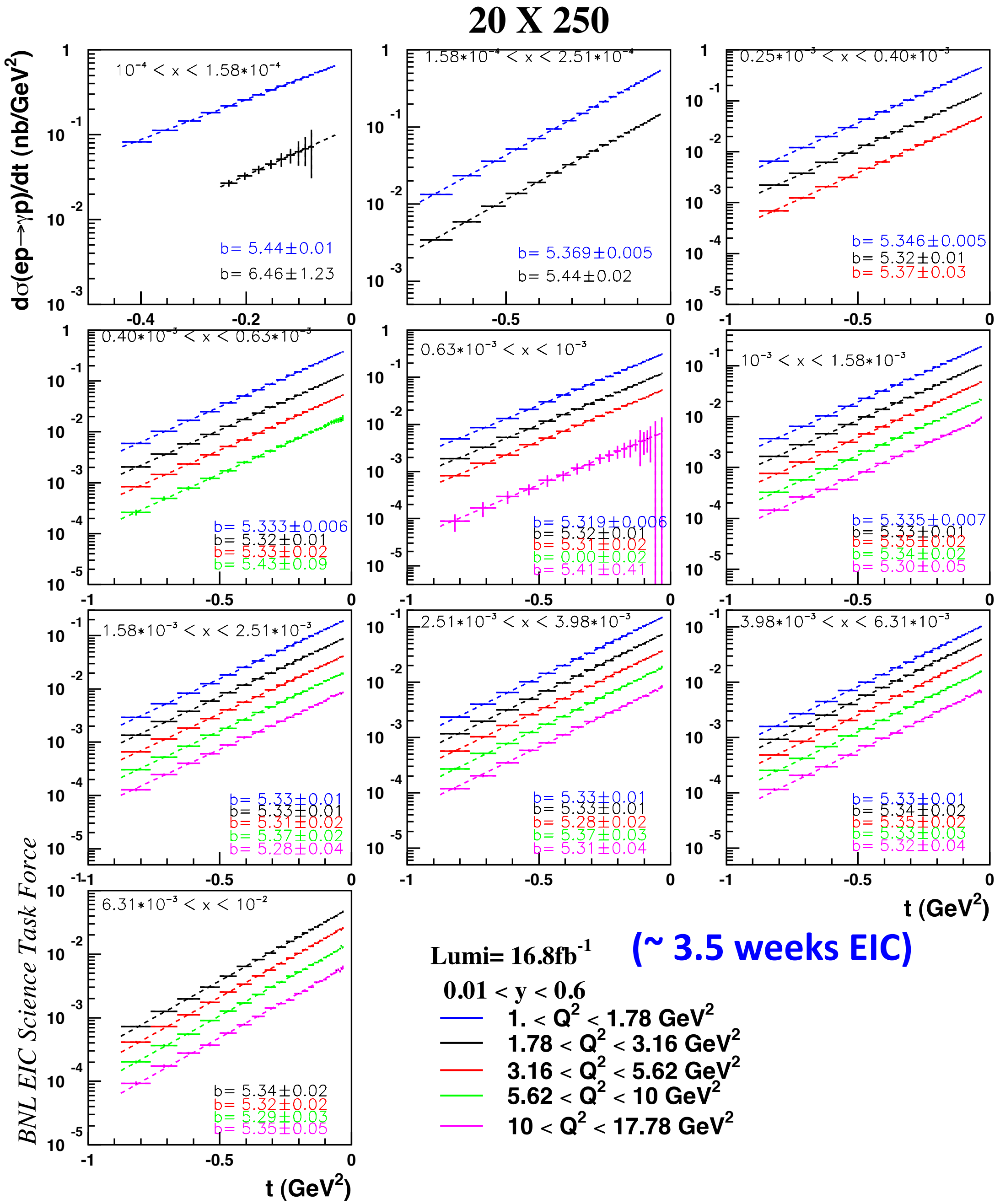
Specifications:

- **Statistical error down to 1%**
- **It uses smeared t values (5% momentum resol.)**
- **|t|-binning –> 3 * resolution (or higher)**

dσ/d|t|- Stage 2

$$\frac{d\sigma}{d|t|} = \frac{\#\,evt}{\Delta_{bin} \bullet A \bullet \mathcal{L}} \qquad \sim e^{-bt}$$

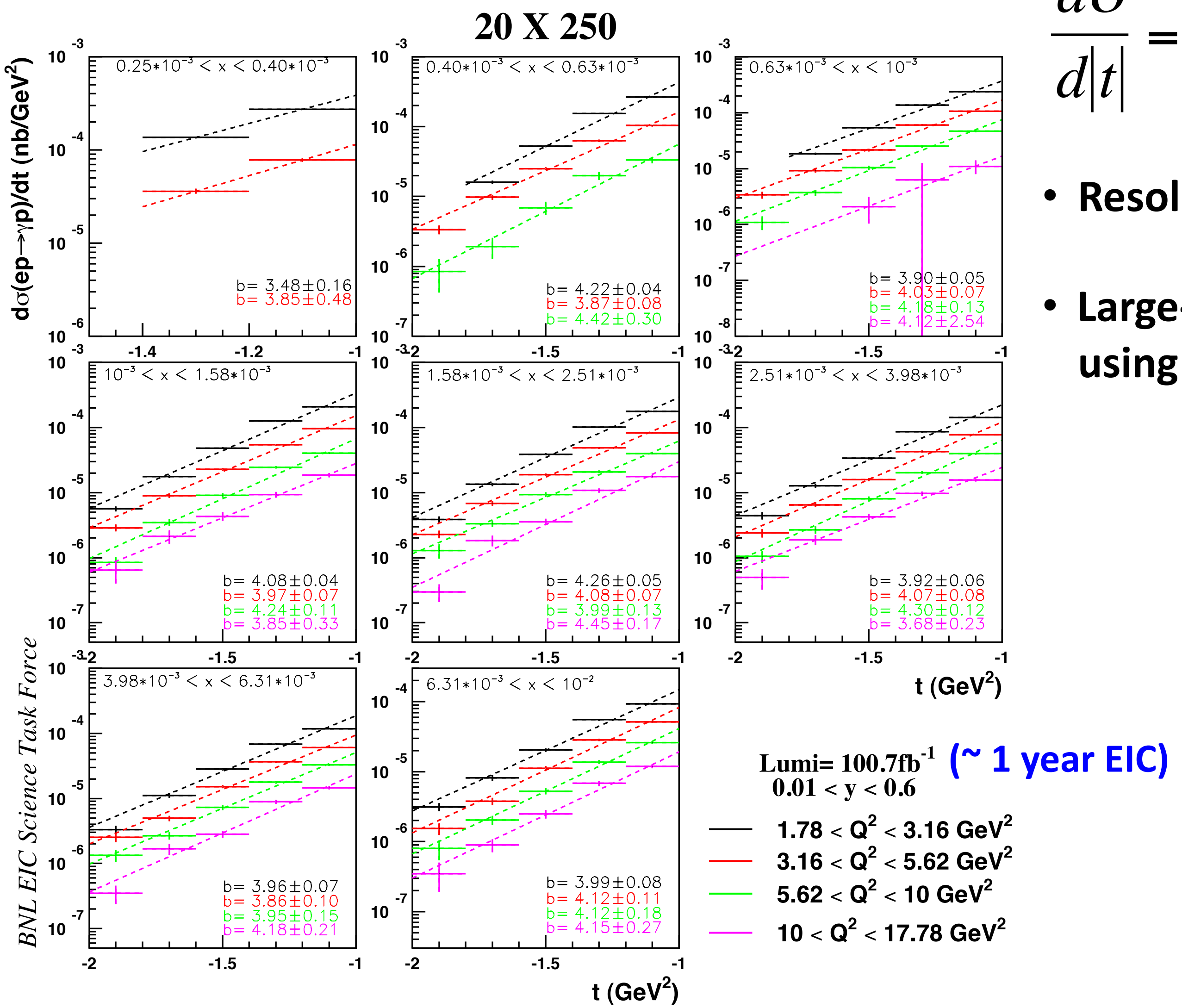
b=5.6



dσ/d|t|- Stage 2

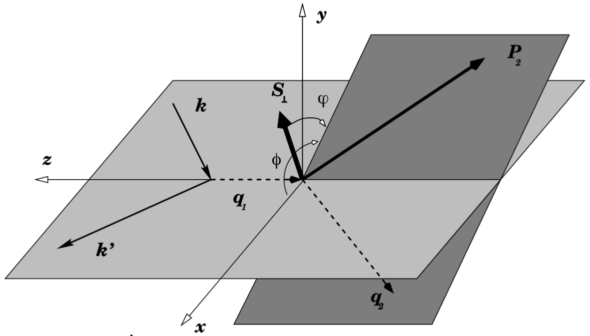
$$\frac{d\sigma}{d|t|} = \frac{\# evt}{\Delta_{bin} \bullet A \bullet \mathcal{L}} \qquad \sim e^{-bt}$$

b=5.6



- **Resolution: uniform assumed ~20%**
- **Large-|t| -> |t| is reconstructed using the main detector**

Charge and spin asymmetries



$$\phi = \phi_N - \phi_l$$

Angle btw the production and scattering planes

$$\varphi = \Phi_T - \phi_N$$

Angle btw the scattering plane and the transverse pol. vector

$$A_C = \frac{d\sigma^+ - d\sigma^-}{d\sigma^+ + d\sigma^-} \propto Re\left(A_{DVCS}\right)$$

→ **Requires a positron beam at eRHIC**

$$A_{LU} \propto y\left[F_1(t)H\left(\xi,\xi,t,Q^2\right) - \frac{t}{4M^2}F_2(t)E\left(\xi,\xi,t,Q^2\right) + \ldots\right]$$

Dominated by H, slightly depentent on E

$$A_{UT} \propto \frac{t}{4M^2}\left[F_2(t)H\left(\xi,\xi,t,Q^2\right) - F_1(t)E\left(\xi,\xi,t,Q^2\right) + \ldots\right]$$

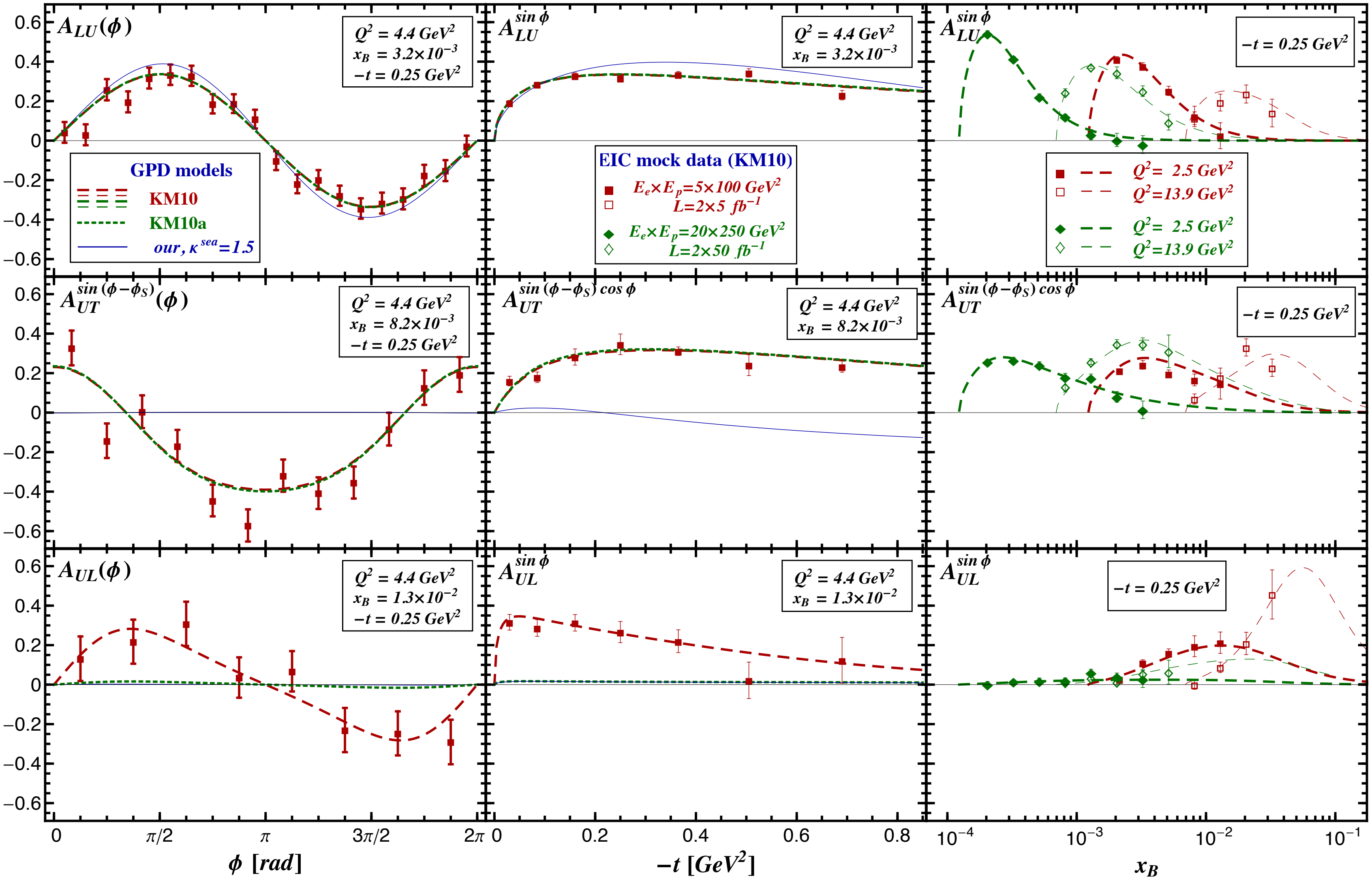
sin($\Phi_T - \phi_N$) **governed by E and H**

MILOU Monte Carlo does not include a transverse polarization of the beams

To show the impact of an EIC on such a measurement we simulated event distributions as a function of ϕ considering 80% polarization and half statistics for each spin configuration. This led to zero values with realistic statistical uncertainties proportional to ϕ, which have been applied to K-M model. (See. D. Mueller's talk)

We can also bin in |t| → [0.01;0.05;0.12;0.2;0.3;0.43;0.58;0.80] and [1.0;1.2;1.5] GeV^2

Asymmetries



Plots from D. Mueller

Few thoughts on the systematics

Understanding the systematic before having a full detector simulation and even knowing sub-detector specifications it is simply not realistic.

Nevertheless, to have a quantitative idea of the order one can expect, I looked at the ZEUS DVCS-analysis (using Roman Pots). Here are their main sources of systematics:

- Beam-halo, (E+Pz+2Pz(RP)<1860 GeV → only 3% bkd survives (negligible @ ZEUS)
- t resolution → bin properly, accordingly to resolution.
- X coordinate in RP → this syst. Was due to an inaccurate simulation of the RP detectors.
- Minimum approach of the track to the beam-pipe

TOTAL = 8%

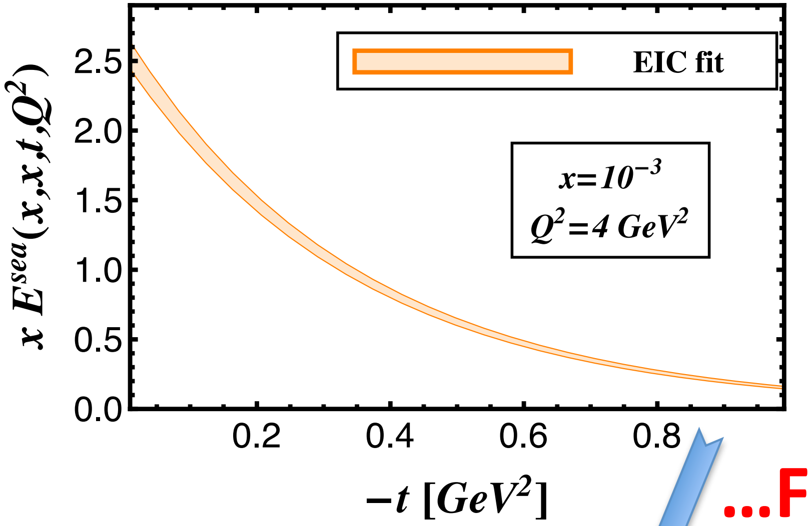
- LUMI (2.25%) → does not affect the t-slope

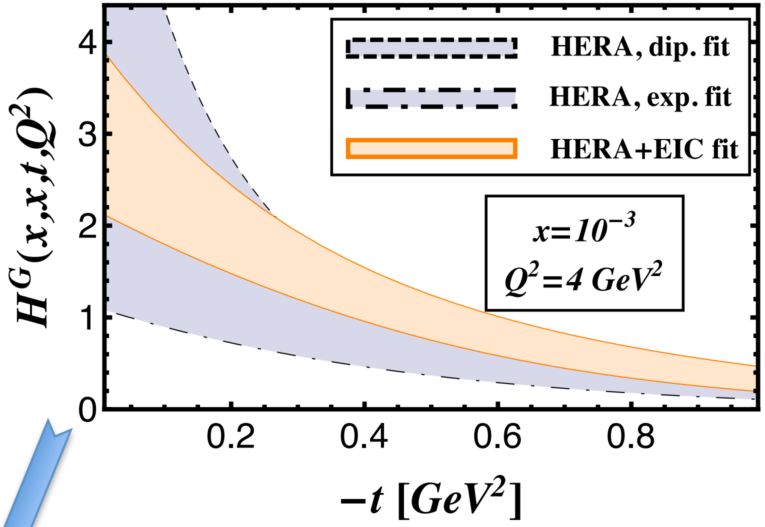
$\pi^0 \rightarrow \gamma\gamma$ was found negligible (@ HERA but @ eRHIC?)

For the moment, for the purpose of fits using pseudo-data, we'll be using a realistic value of 5%

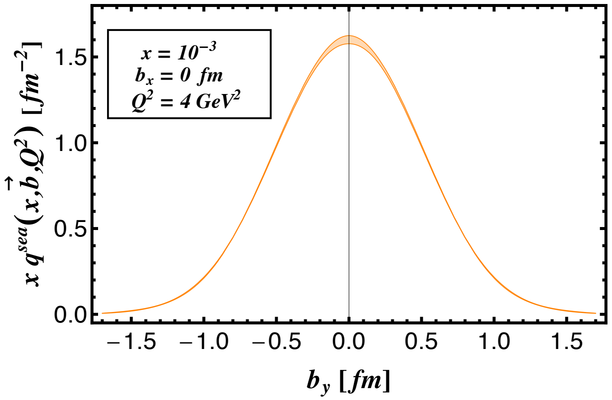
Imaging

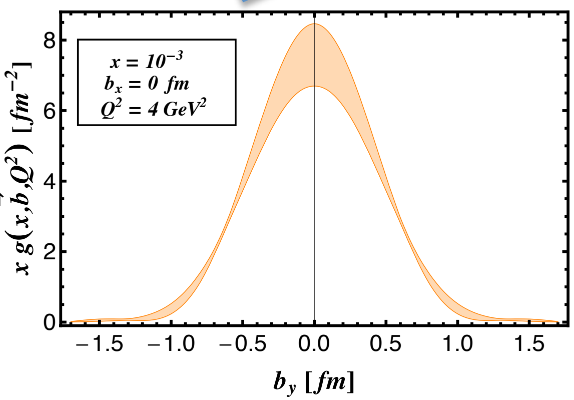
Plots from D. Mueller





...FIT...

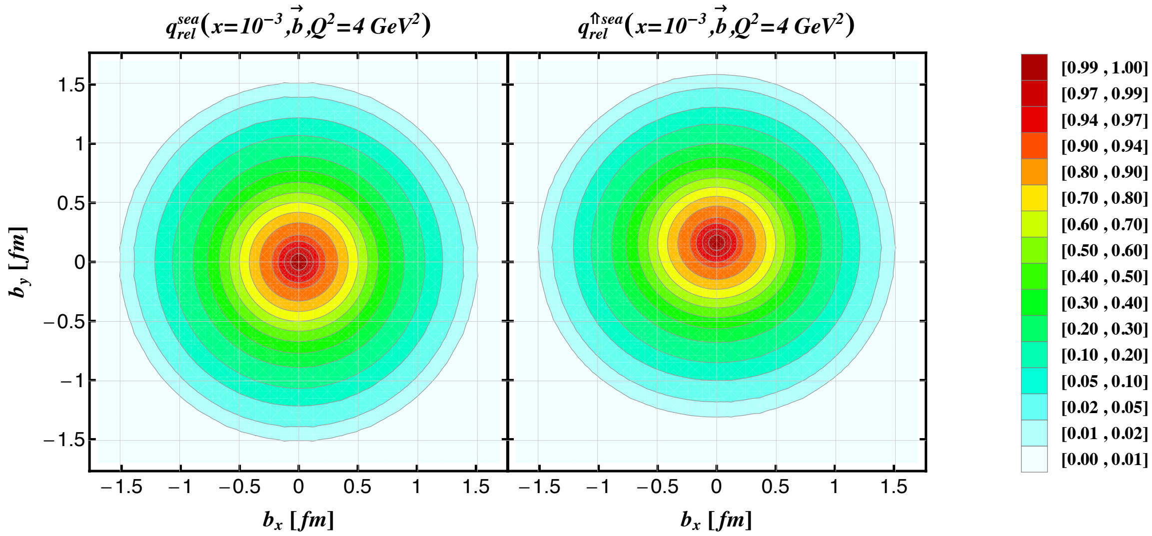




Errors are extrapolated for:
|t|→ 0 ; |t| > 1.5 GeV²

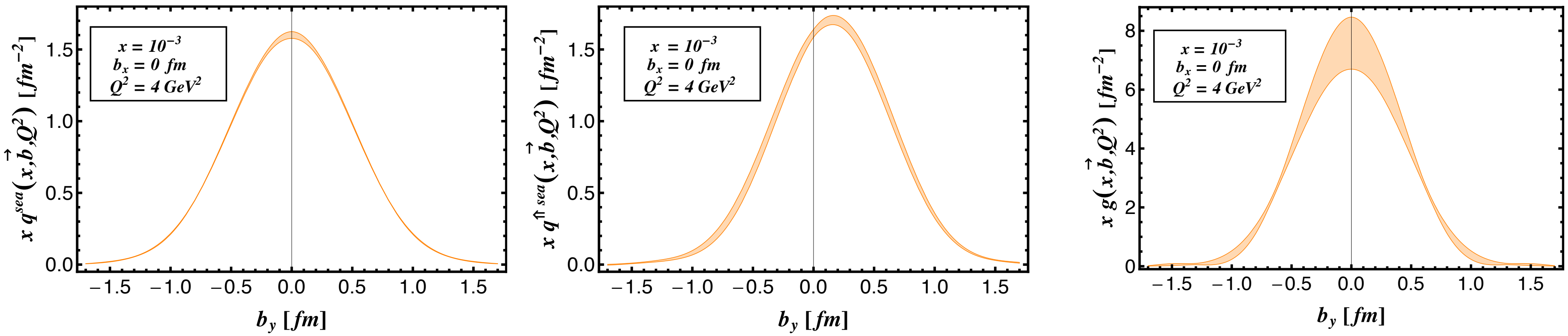
$$q\left(x,\vec{b},\mu^2\right) = \frac{1}{\pi}\int_0^\infty d|t|\, J_0\left(|\vec{b}|\sqrt{|t|}\right) H\left(x,\eta=0,t,\mu^2\right)$$

Imaging



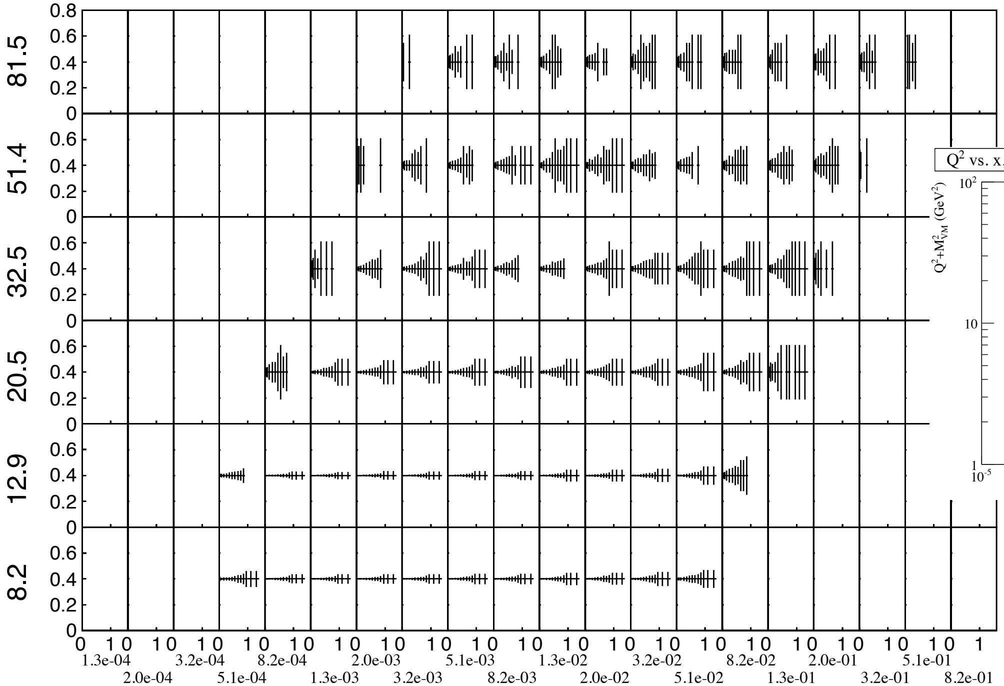
Plots from D. Mueller

- **A global fit over all mock data was done, based on the GPDs-based model:**
  [K. Kumerički, D Müller, K. Passek-Kumerički 2007]
- **Known values *q(x)*, *g(x)* are assumed for *H^q*, *H^g* (at =0, t=0 forward limits *E^q*, *E^g* are unknown)**
- **Excellent reconstruction of *H^{sea}*, *H^{sea}* and good reconstruction of *H^g* (from *dσ/dt*)**

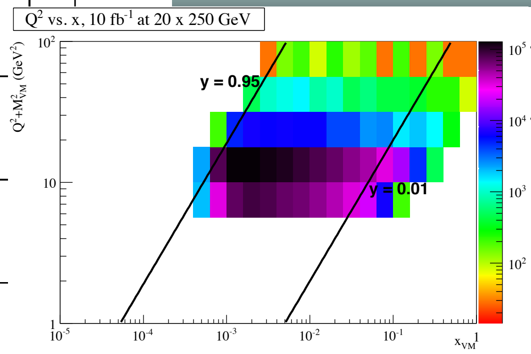


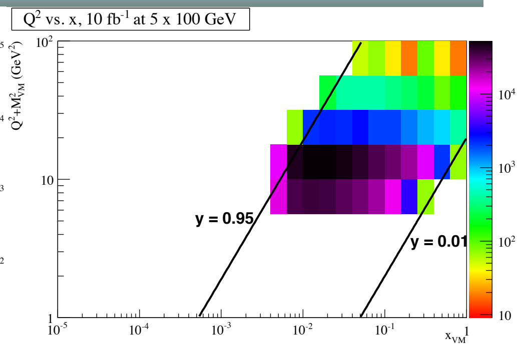
See also: D. Mueller's talk for details
M. Diehl's talk for an overview

J/ψ

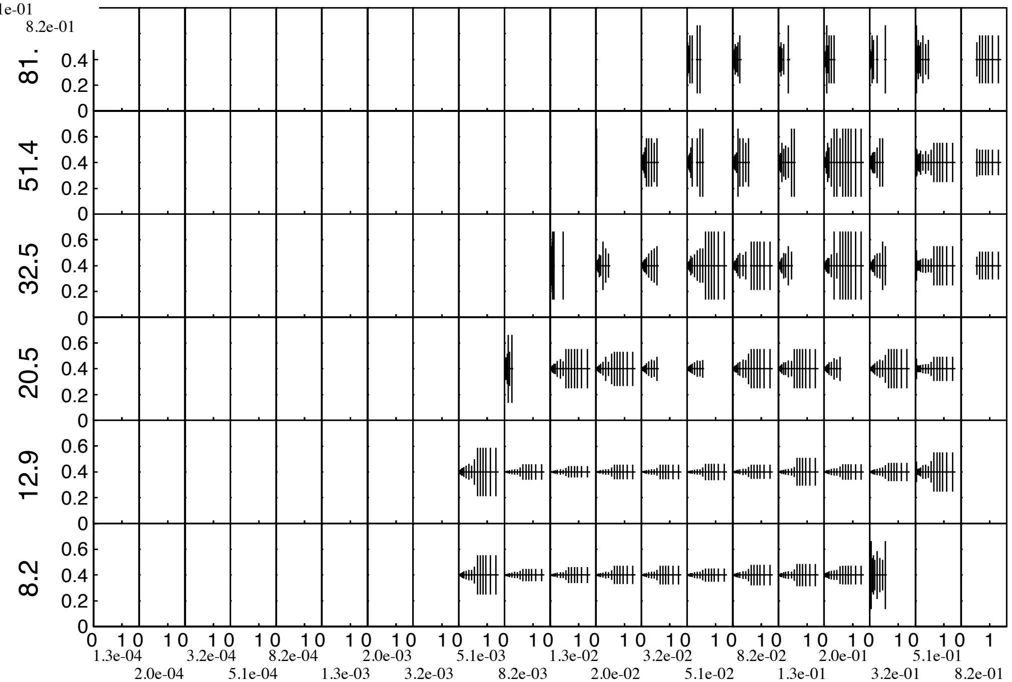


Plots from E. Aschenauer





Simulated uncertainties for a measurement of A_{UT} vs ϕ at eRHIC in bins of Q2 and x

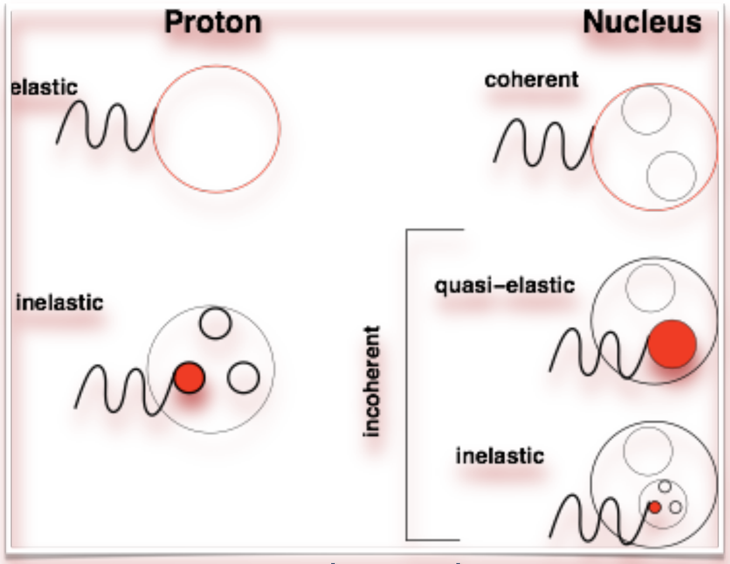


γ*p -> J/ψ p (gives access to gluons)

- wave function uncert. (non-relativistic approximation)
- mass provides hard scale
  - Both photo- and electro-production can be computed
- pseudo-data generated using a version of Pythia tuned to J/ψ data from HERA

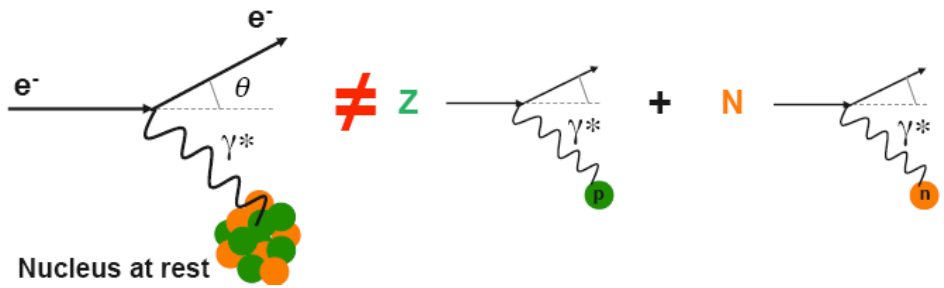
DVCS on nuclear targets

- ❑ How does the nuclear environment modify parton-parton correlations?
- ❑ How do nucleon properties change in the nuclear medium?



(Bethe-Heitler)

- ❑ DVCS in coherent region:
  new insights into 'generalized EMC effect'?



- ❑ Nuclear GPDs ≠ GPDs of free nucleon
- ❑ Enhancement of effect when leaving forward limit?
  - ➢ caused by transverse motion of partons in nuclei?
  - ➢ important role of mesonic degrees of freedom?
  - ➢ manifest in strong increase of real part of τ_{DVCS} with atomic mass number A?

MC simulation for DVCS on nuclei coming soon thanks to an updated version of MILOU code

Summary

- **A lot of experience carried over from HERA**
- **Simulation shows how an eRHIC can much improve our knowledge of GPDs a.r.o. HERA**
- **A fine binning of x-sec and symmetries will be possible, uncertainties mostly dominated by systematics**
- **Large potential for an accurate 2+1D imaging of the polarized and unpolarized quarks and gluons inside the hadrons (and nuclei!)**

Back up

Measuring t indirectly with an EIC

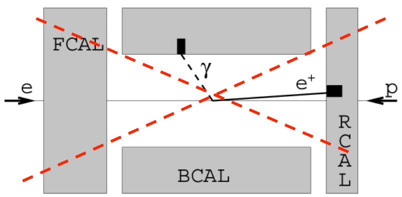
To successfully measure t indirectly from the electron and photon candidates

$$t \sim \left| P_{T\gamma}^2 + P_{T_e}^2 \right|^2$$

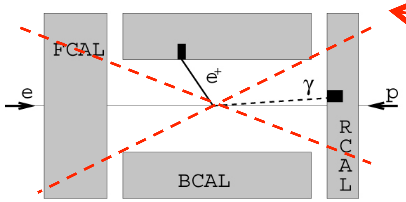
it is important:

❖Tracker coverage (tracker has higher momentum resolution than Cal!)

Reso of the CTD @ ZEUS: $\sigma(p_T)/p_T = 0.0058 p_T \oplus 0.0065 \oplus 0.0014/p_T$



DVCS/BH



BH

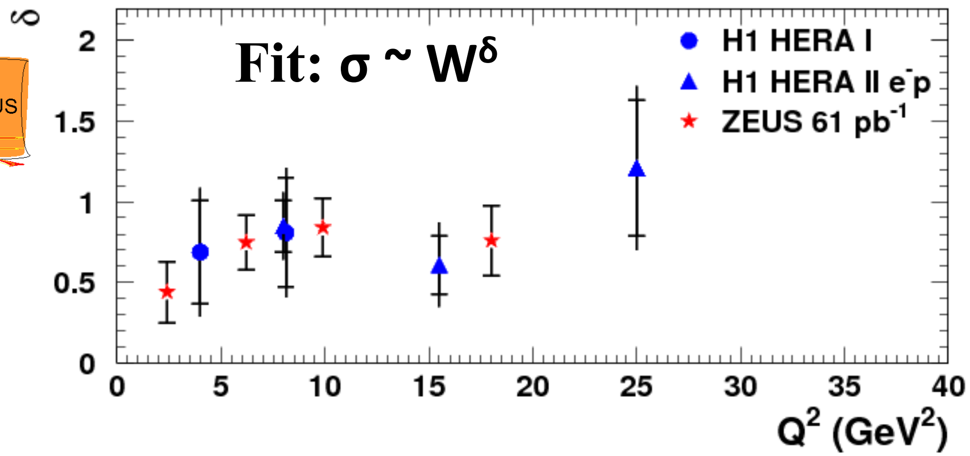
CTD acceptance @ ZEUS

Always measure a track when we can -> better momentum resolution but not only… More acceptance for DVCS!

❖High resolution em calorimetry (crucial! Remember that one particle is a photon!)

For ZEUS it was *σ(E)/E=0.18/√E*

DVCS @ HERA

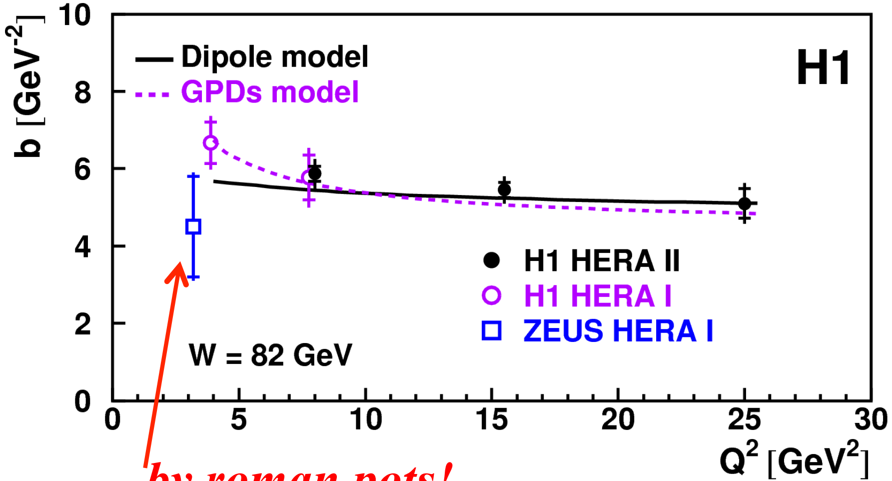


Q^2 dependence for the W slope not clear within the uncertainties!

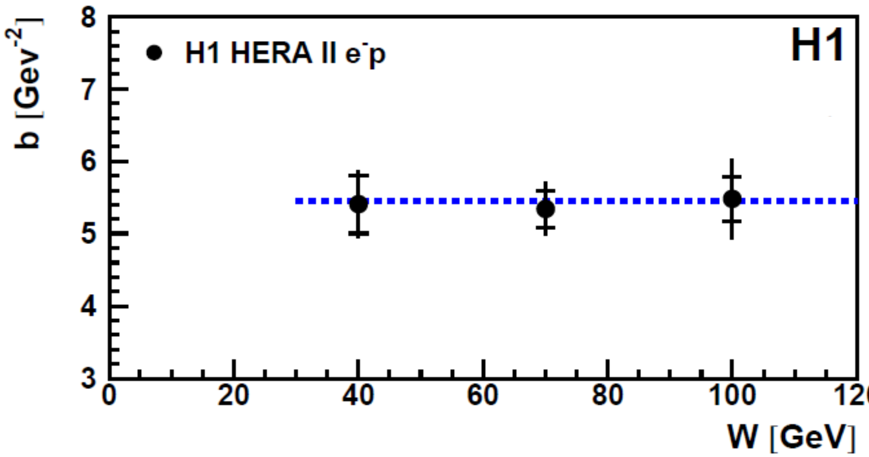
ZEUS: JHEP05(2009)108
H1: Phys.Lett.B659:796-806,2008

t measured indirectly: $t \sim \left(P_{T\gamma}^2 + P_{T_e}^2\right)^2$

$Fit: \frac{d\sigma}{dt} \propto e^{-b|t|}$

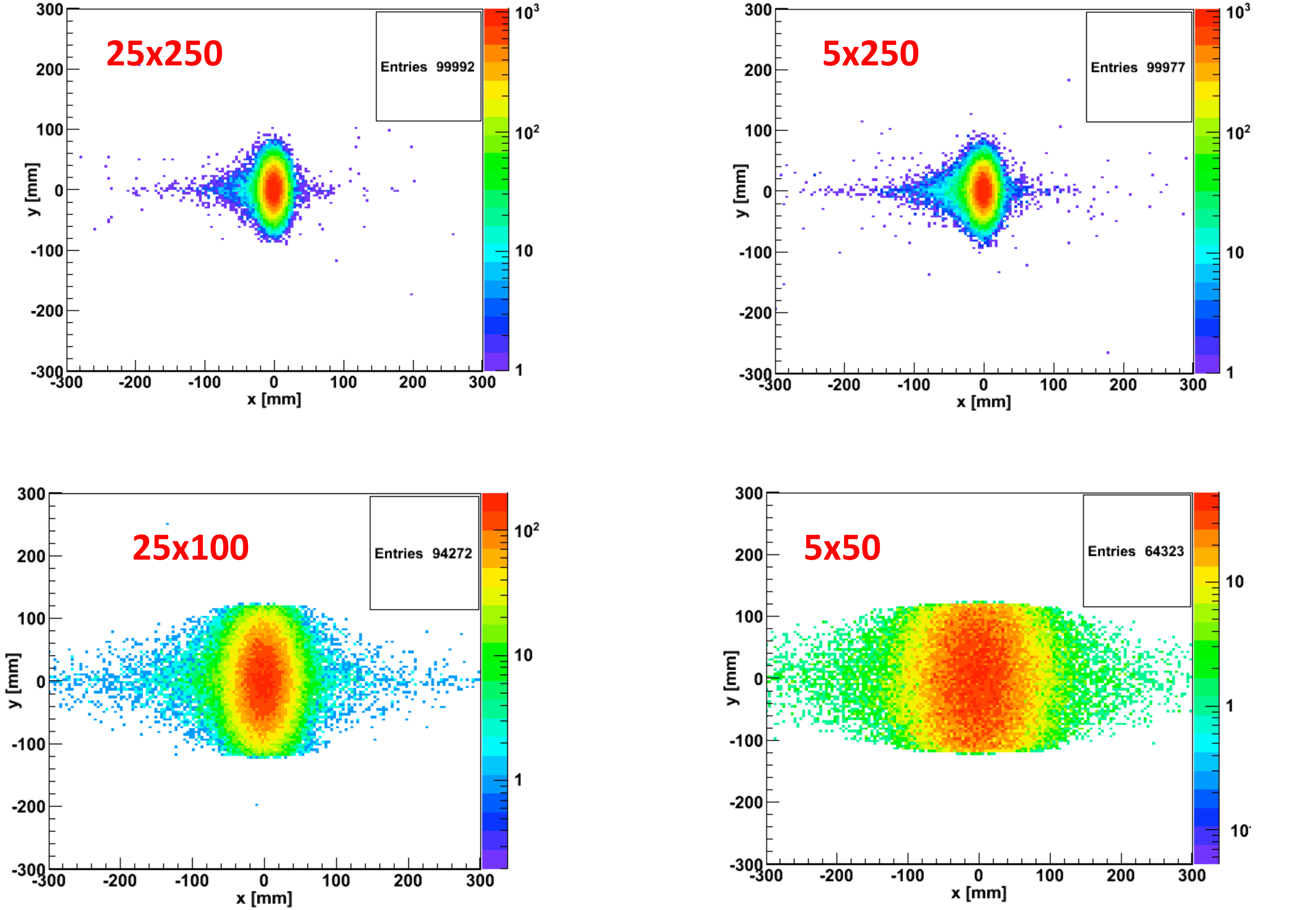


by roman pots!



No evidence for *W* dependence of *b*

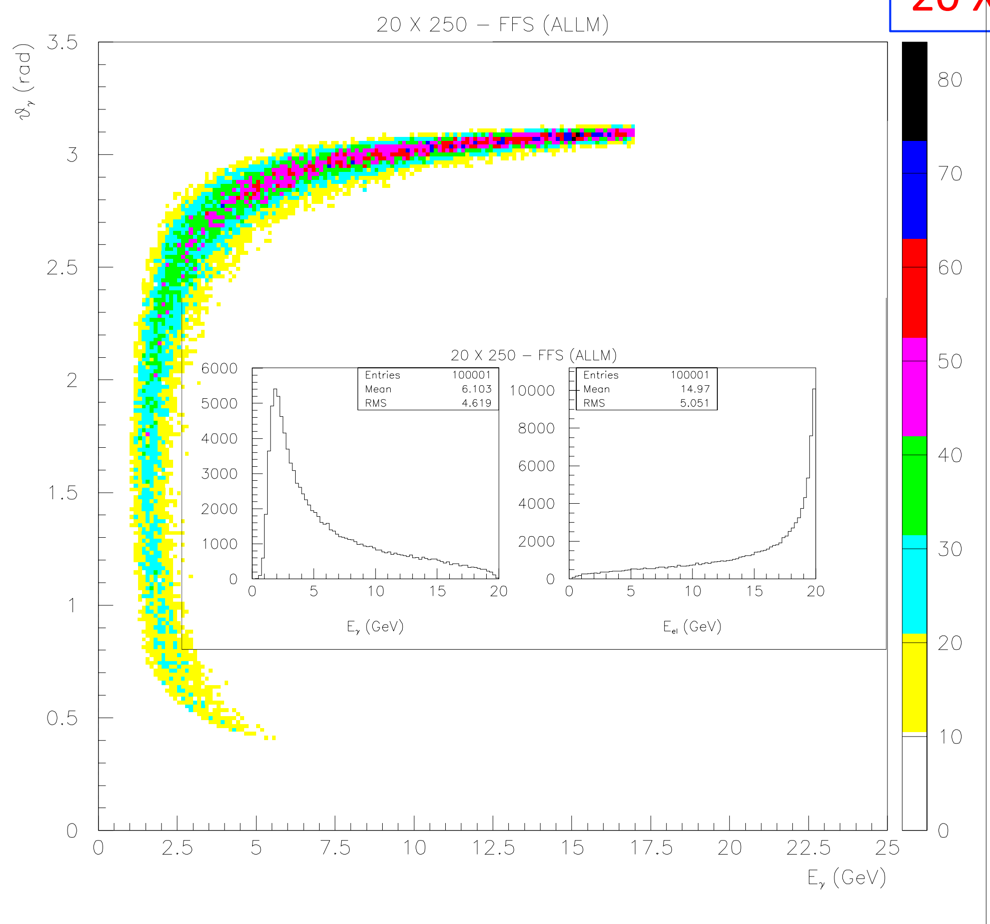
Quadrupole aperture limits

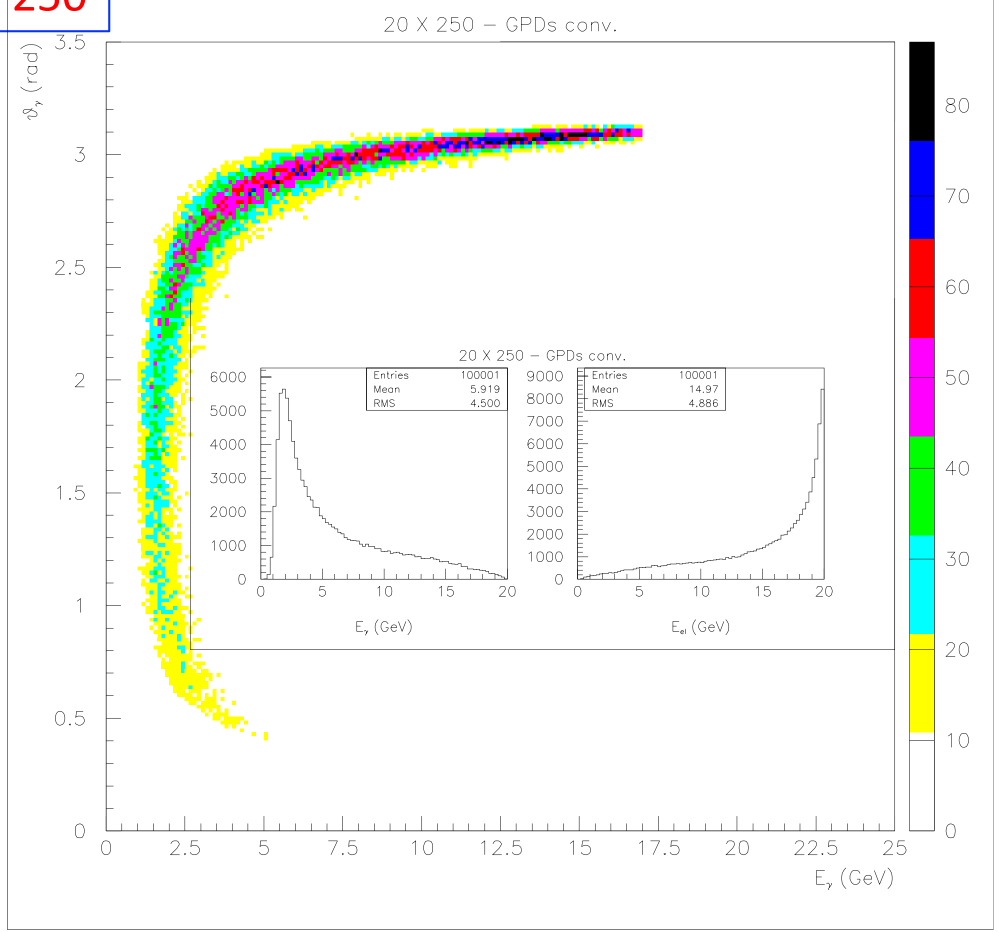


Thanks to J-H Lee

θ_γ vs E_γ

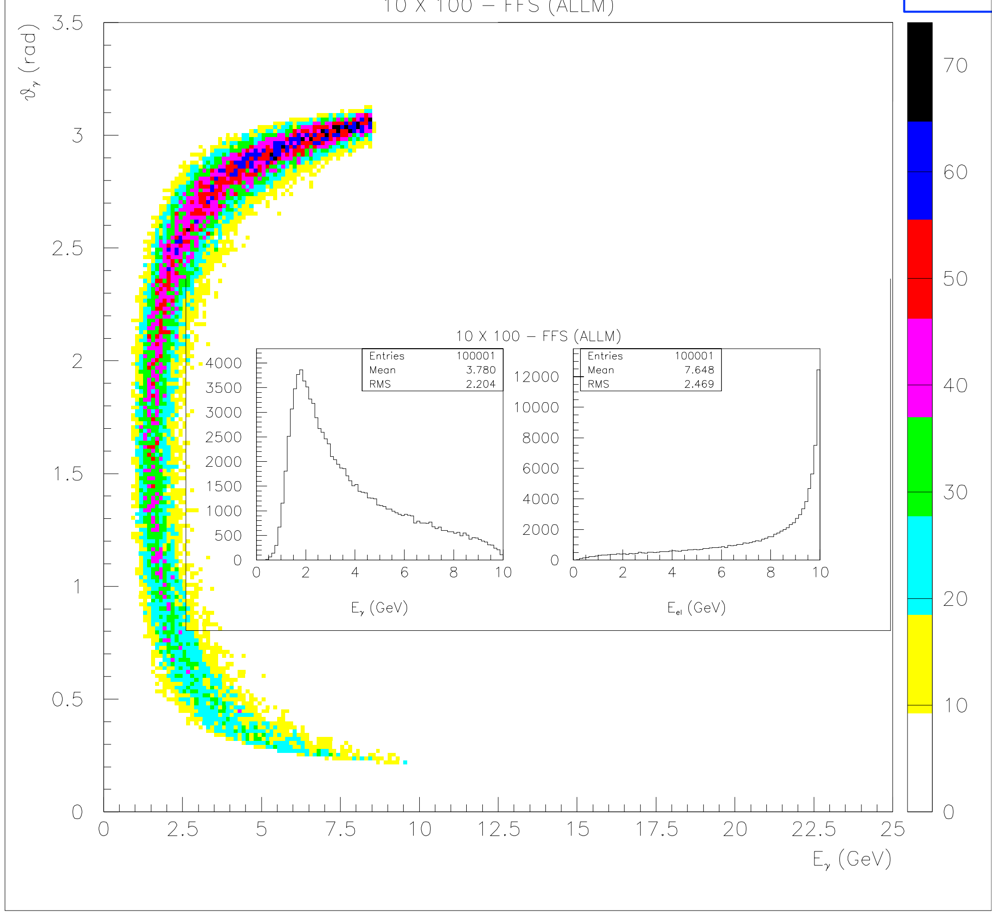
20 X 250

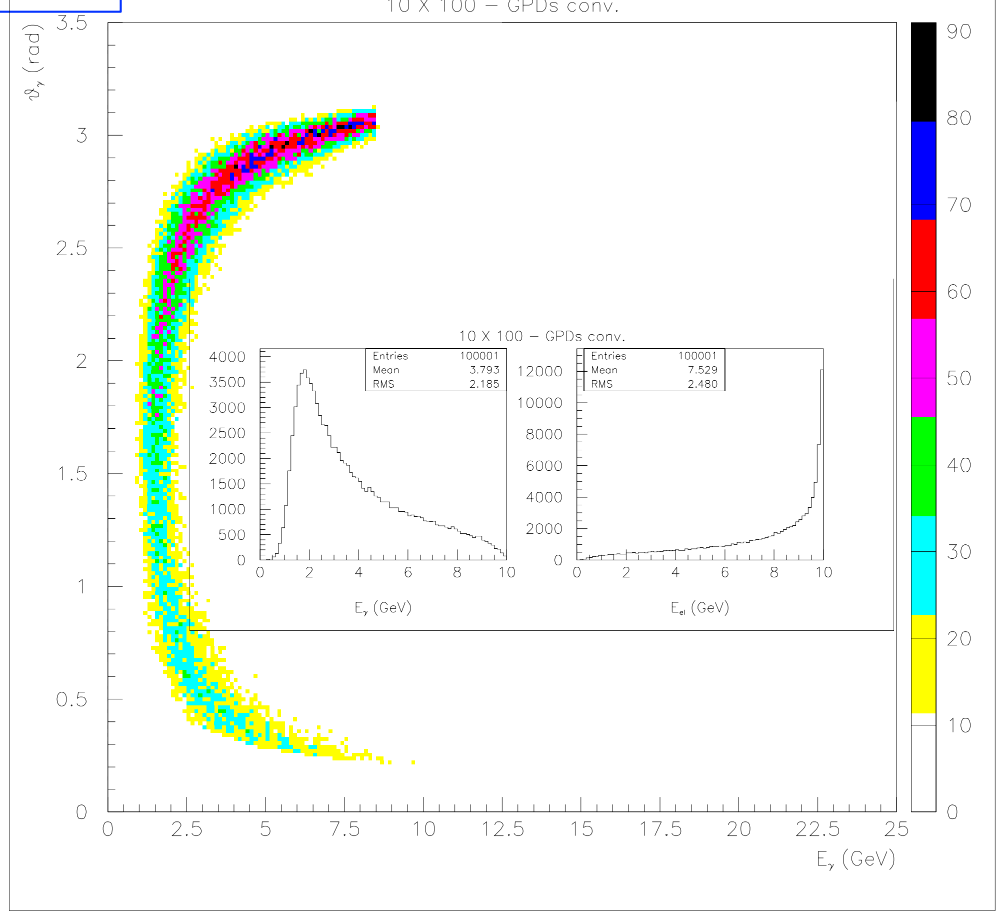




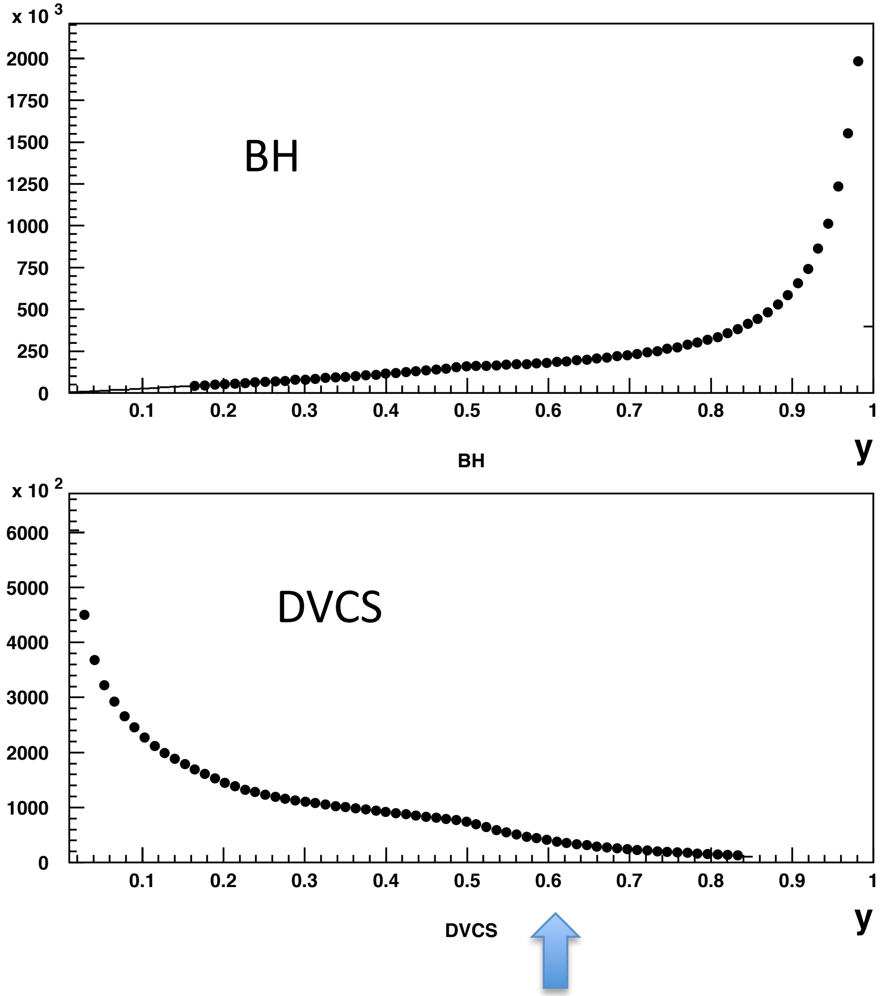
θ_γ vs E_γ

10 X 100

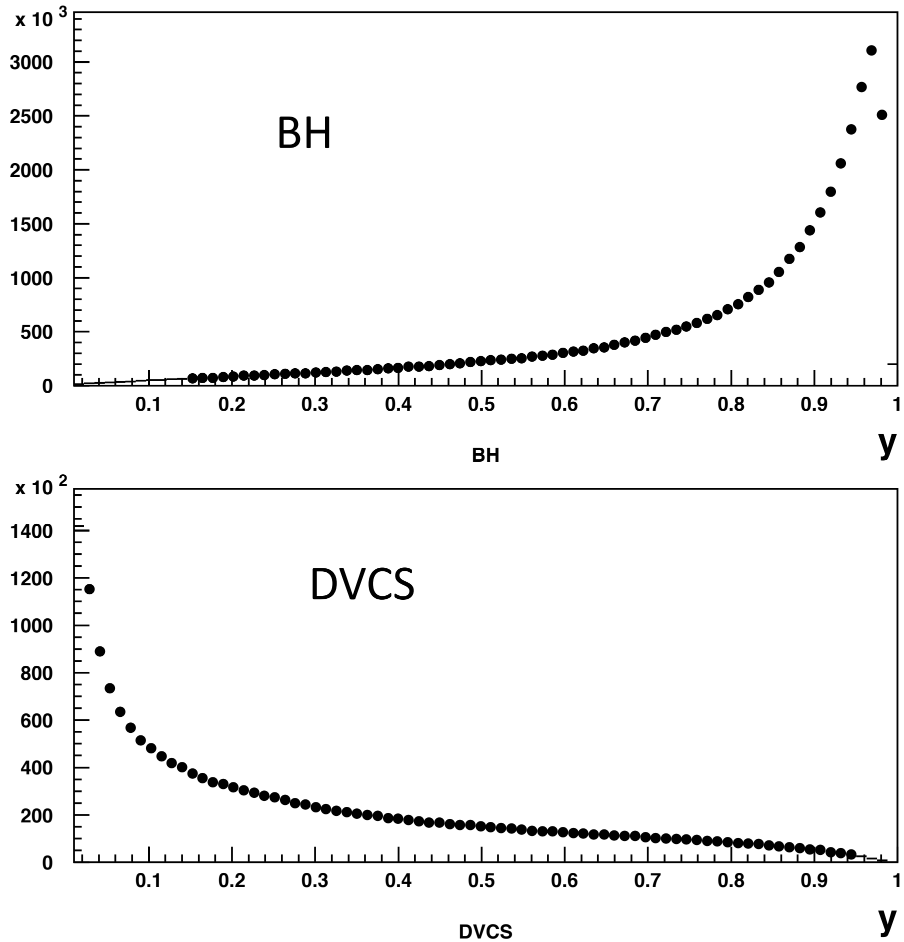




20 X 250



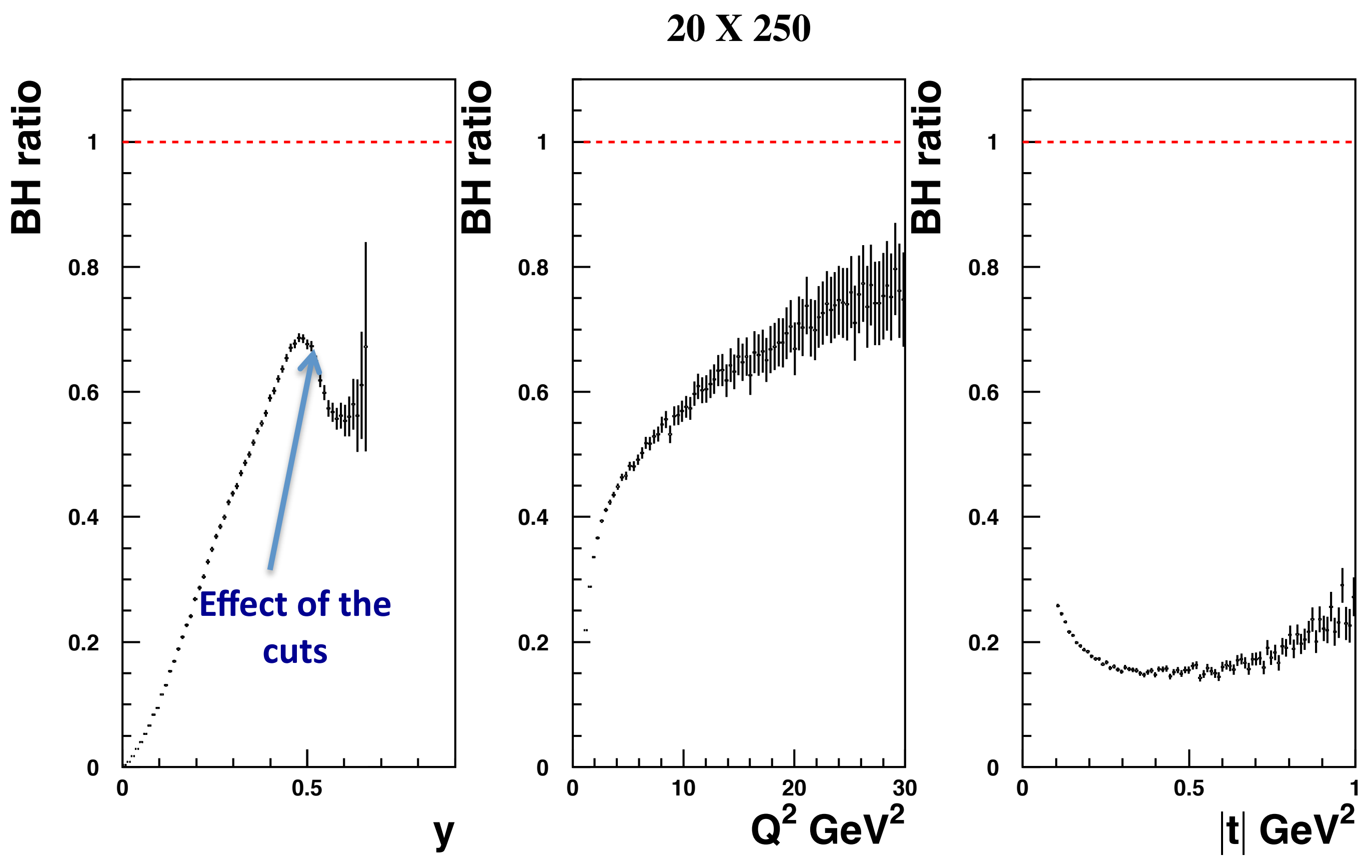
5 X 100



- BH dominates at large y.
- DVCS dropes with y

But…

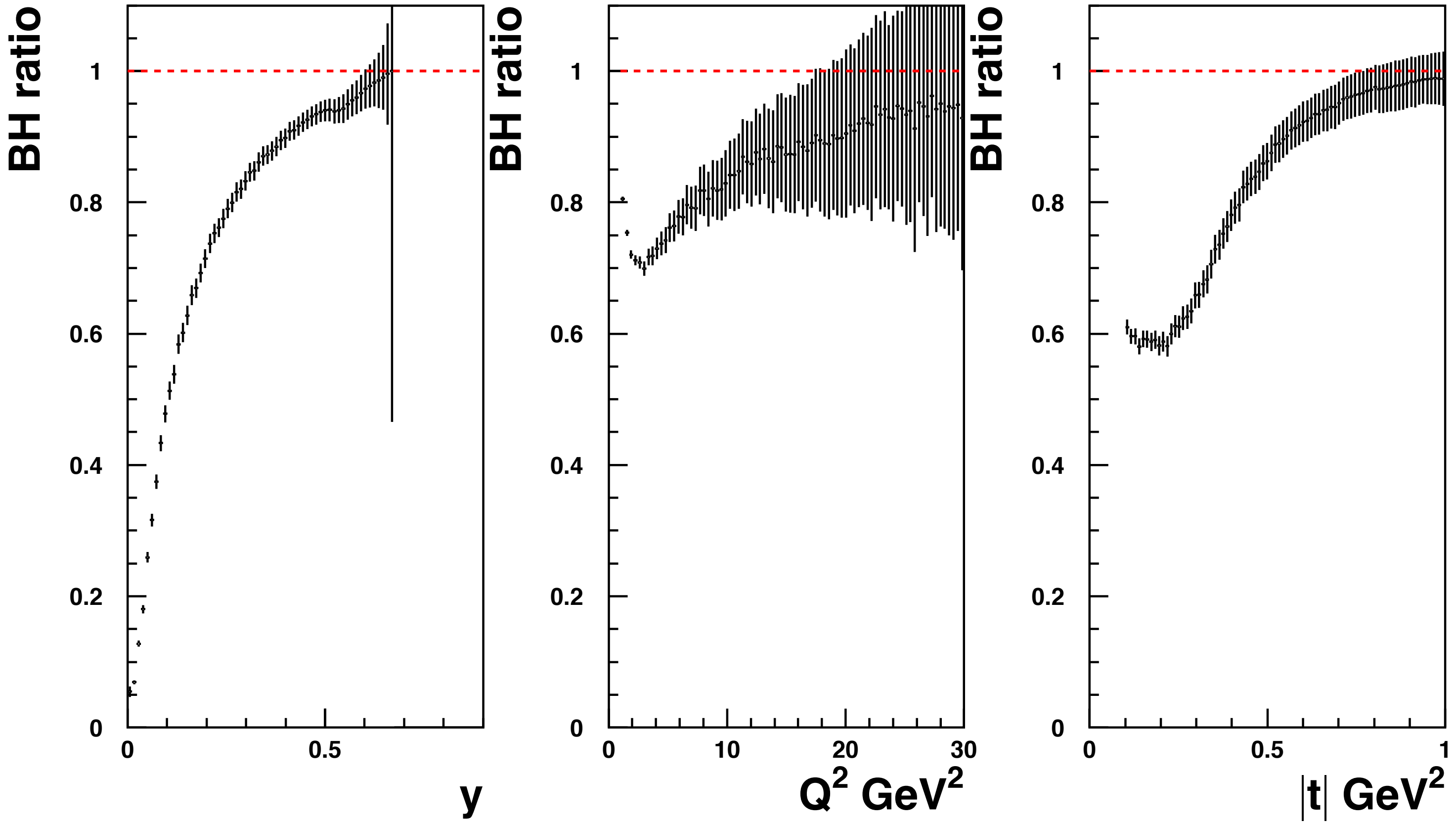
BH fraction - overall



The effect of the cut for the 20x250 conf. is that BH never exceeds 70% of the sample

BH fraction - overall

5 X 100



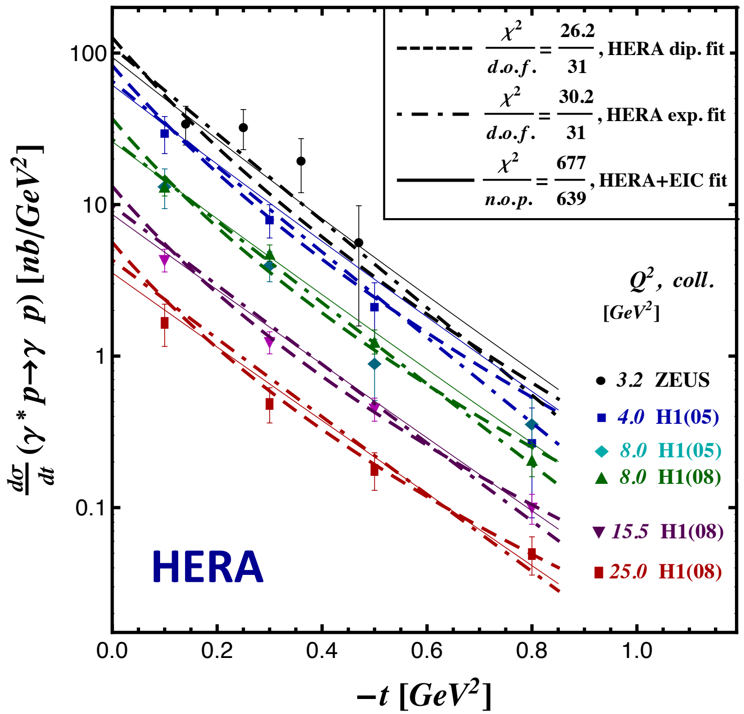
for the 5x100 conf. is that BH can be a problem at large y and large t, depending on the bin

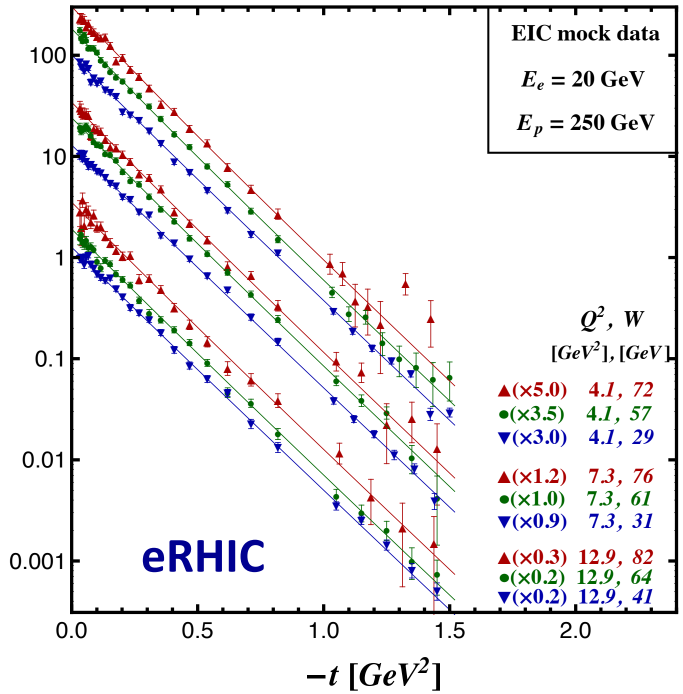
t-xsec (ep -> γp)

Selection criteria:

$0.01 < y < 0.6$
$\theta\gamma < 2\times10^{-2}$ rad
$\theta el < 2\times10^{-2}$ rad
$E\gamma > 1$ GeV
$Eel > 1$ GeV

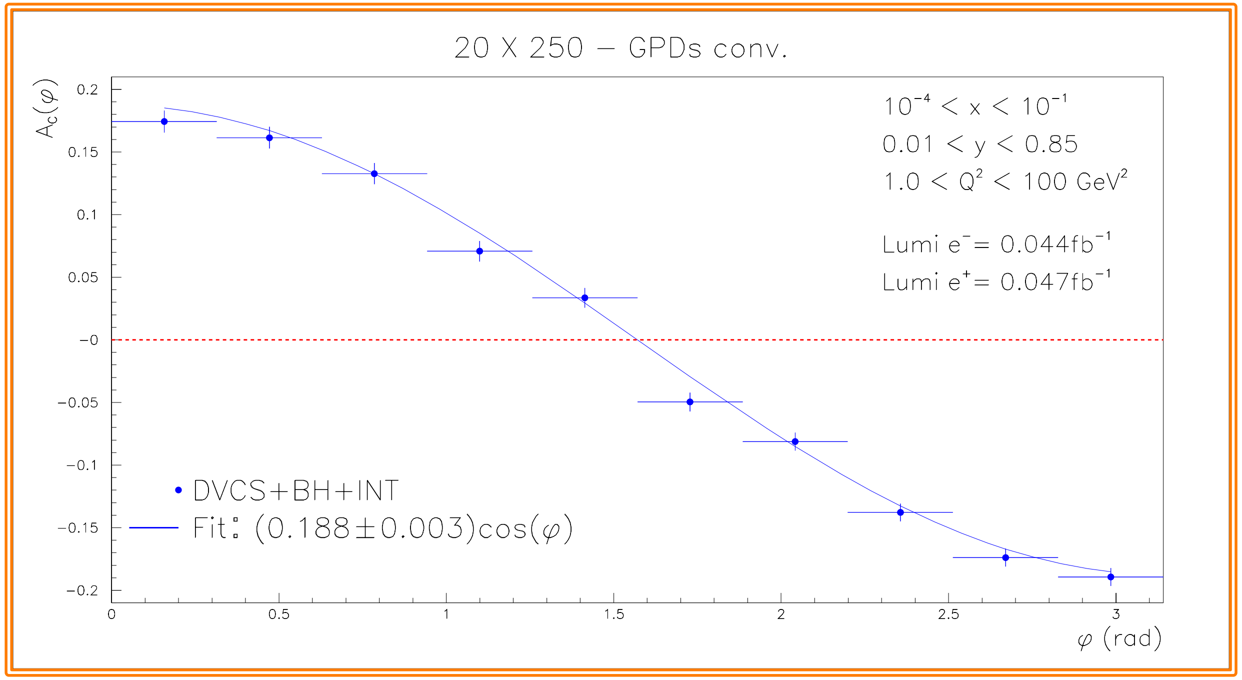
$\sim e^{-bt}$ b=5.6 GeV^{-2}

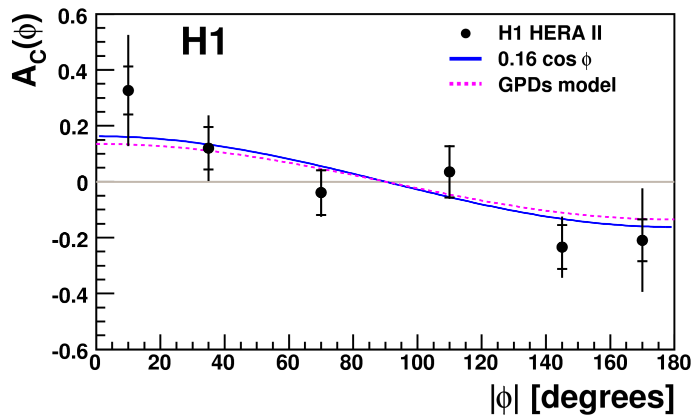


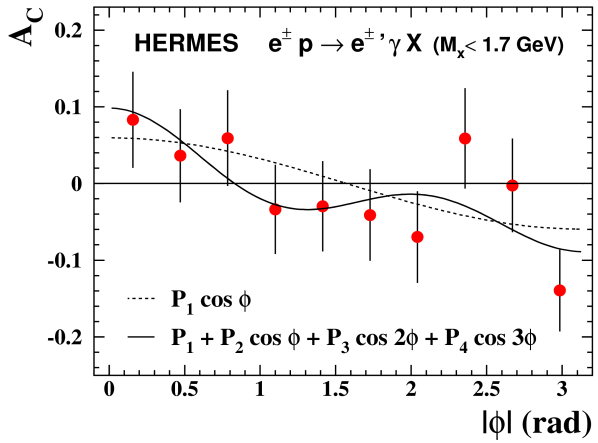


10 x-bins → [1.;1.58;2.51;4.;6.3;15.8;25.1;39.8;63.1;100]X10^{-3} (stage 1)
[1.;1.58;2.51;4.;6.3;15.8;25.1;39.8;63.1;100]X10^{-4} (stage 2)
5 Q^2-bins → [1.;1.78;3.16;5.62;10;17.78] GeV^2

Beam Charge Asymmetry



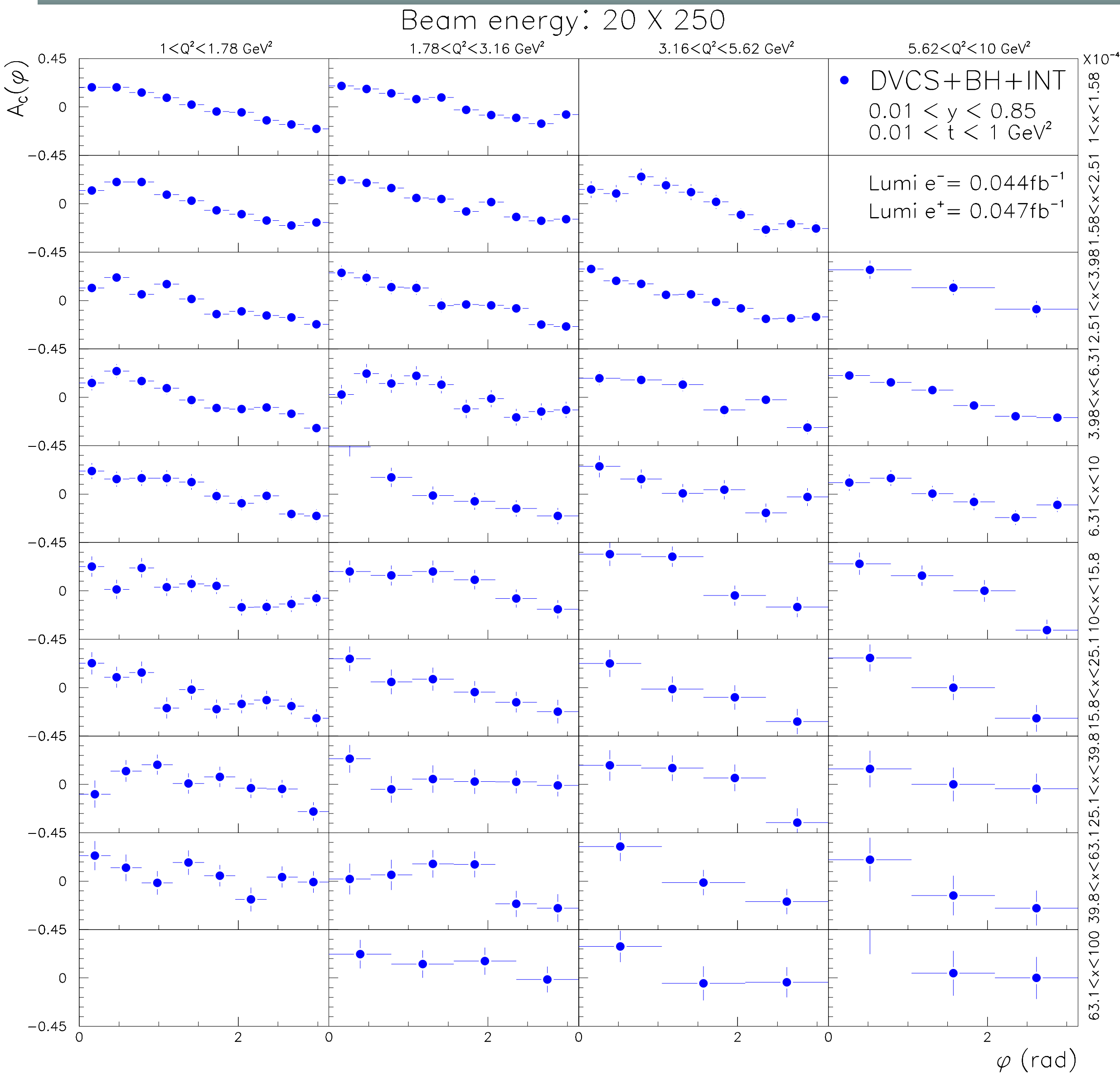




$$A_C = \frac{\frac{d\sigma^+}{d|\phi|} - \frac{d\sigma^-}{d|\phi|}}{\frac{d\sigma^+}{d|\phi|} + \frac{d\sigma^-}{d|\phi|}} = p_1 \cos(\phi) = 2A_{BH} \frac{\mathrm{Re}\, A_{DVCS}}{|A_{DVCS}|^2 + |A_{BH}|^2} \cos(\phi)$$

Excellent measurement with a modest beam-time. Accurate measurements in bins of Q^2 and x are possible!

Beam Charge Asymmetry



10^{-4}<x<1.58×10^{-4}

1.58×10^{-4}<x<2.51×10^{-4}

2.51×10^{-4}<x<3.98×10^{-4}

3.98×10^{-4}<x<6.31×10^{-4}

6.31×10^{-4}<x<10^{-3}

10^{-3}<x<1.58×10^{-3}

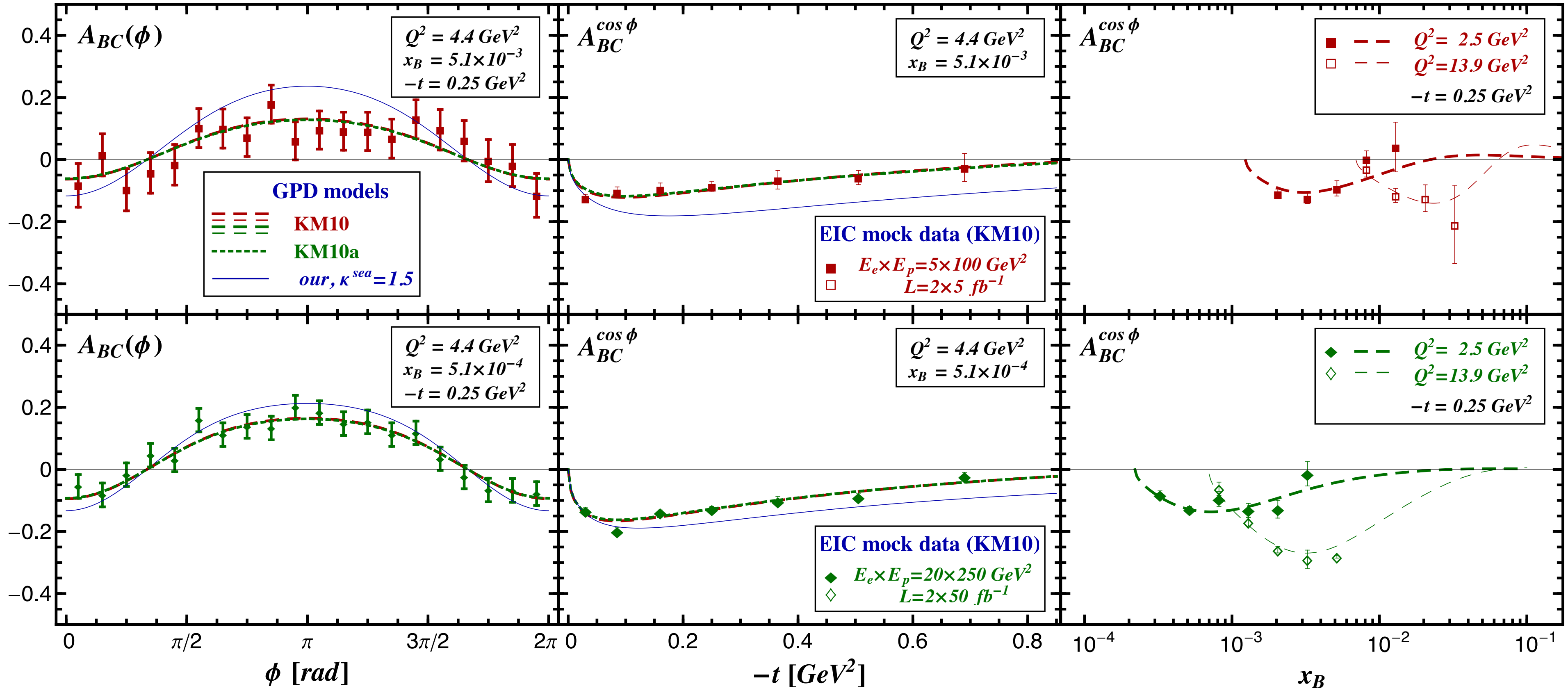
1.58×10^{-3}<x<2.51×10^{-3}

2.51×10^{-3}<x<3.98×10^{-3}

3.98×10^{-3}<x<6.31×10^{-3}

6.31×10^{-3}<x<10^{-2}

Requires a positron beam at eRHIC



$A_{BC}(\phi)$
$Q^2 = 4.4\ GeV^2$
$x_B = 5.1\times10^{-3}$
$-t = 0.25\ GeV^2$
GPD models
KM10
KM10a
our, κ^{sea}=1.5
$A_{BC}^{\cos\phi}$
$Q^2 = 4.4\ GeV^2$
$x_B = 5.1\times10^{-3}$
EIC mock data (KM10)
$E_e\times E_p=5\times100\ GeV^2$
$L=2\times5\ fb^{-1}$
$A_{BC}^{\cos\phi}$
$Q^2= 2.5\ GeV^2$
$Q^2=13.9\ GeV^2$
$-t = 0.25\ GeV^2$
$A_{BC}(\phi)$
$Q^2 = 4.4\ GeV^2$
$x_B = 5.1\times10^{-4}$
$-t = 0.25\ GeV^2$
$A_{BC}^{\cos\phi}$
$Q^2 = 4.4\ GeV^2$
$x_B = 5.1\times10^{-4}$
EIC mock data (KM10)
$E_e\times E_p=20\times250\ GeV^2$
$L=2\times50\ fb^{-1}$
$A_{BC}^{\cos\phi}$
$Q^2= 2.5\ GeV^2$
$Q^2=13.9\ GeV^2$
$-t = 0.25\ GeV^2$
ϕ [rad]
$-t\ [GeV^2]$
x_B